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December 1984

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Commodore Horizons welcomes readers' contributions — either articles or program listings. Articles should be typed double-spaced with a wide margin. Programs should, whenever possible, be printed out on plain white paper, accompanied by a cassette. We cannot guarantee to return every article or program submitted, so please keep a copy. If you want to have your program returned you must include an a.s.a.



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EDITORIAL

NINETEEN EIGHTY FIVE may yet be the year of the 16-bit computer. The home micro boom, which has been almost exclusively 8-bit based, is due to evolve into a more advanced, and possibly more stable, market. The days of microprocessors such as the 2801, 6809 and 6502 are, if not exactly numbered, at least on the wane.

This is not to say that 16-bit computers are either revolutionary or startlingly new, just that up to now they have been mainly confined to business and specialist personal machines such as the Apple Macintosh. Sinclair was arguably the first company to break this mould with the CP902, based around the 6809 chip. But, many people would dispute this machine's claims to be a true 16-bit machine, limited as it is by an 8-bit buffer.

However, Commodore has announced its intention of joining the field with the purchase of Amiga, a small hardware company based in Santa Clara, California. This company has built a 16-bit home computer which is expected to cost less than £1000 (£795). It should appear in Commodore colours some time next year and might even be on display at the Consumer Electronics Show in Las Vegas in January.

Just to complicate matters still further, Atari is using Amiga for £100m for alleged breach of contract. Amiga had a development contract with Atari while the latter was still owned by Warner Communications, though the contract was subsequently cancelled by Amiga.

Given that the Japanese have based their MSX standard on the 8-bit Z80 chip, it makes sense for competing manufacturers to upgrade the specifications of their machines. Perhaps Sinclair, which has just launched its V66 Spectrum +, will enter the fray with a cheap 16-bit games machine in time for Christmas 1985. Certainly Atari seems to be looking in that direction.

The recipe for judging home computers on the amount of RAM they contain may be passing. The new touchstone could be whether it is 8 or 16-bit — or maybe even 32-bit!

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LETTERS PAGE

D-I-Y reset

I HAVE managed to construct a very simple reset button for the 64 by connecting a push-to-complete switch across pins one and three of the user port. Pressing the button has the same effect as SY564738, but of course is independent of the keyboard, so any RUN/STOP/RESET/DELETE/locking poles are rendered useless.

Construction is as complicated as you like; my switch cost 50p and took only three quarters of an hour to assemble. This however is the luxury model, and the "denier" can be made for nothing at all using a short piece of wire or a paper clip! The pins used are 1 (ground) and 3 (reset) (DMLV, not pins A and C underneath the board).

Excitable clips with the lower jaws taped over, or pieces of edge connector can be used to wire up the pins, and the effect is to return the 64 to Basic. You could then, for instance, PHONE address 3048 to 3047 to look at the option — the rest is up to you!

Paul Baylis
Wals
E. Postlebury

Kiwis compute

THANK YOU for your interesting and helpful magazine, which is available every month in New Zealand, unlike some such as *Computer* which we have not seen since April.

A plea for overseas readers — we don't have enough time to enter your competitions by the end of the cover month.

We run a very successful User Group and have a library of cassettes and books and a 1520 printer/plotter. Tapes can be borrowed freely, and as a club we can afford to buy more programs than people would individually — although they cost a small fortune here, cartridge games averaging \$79-999, though good cassette games have come down recently to \$24-99.

Please, more educational programs and programs for the 1520!

Brenda McLeish
Rep. of Islands Computer Group
PO Box 119
R.O.C.I.
New Zealand

Beating Beach Head

WITH REGARD to the letter on *BeachHead* from Ian Davies of Mid-Glasgow, high scores can be achieved due to a slight glitch in the tank section, where the pink

enemy tank appears. Shoot it and keep shooting at the 1000 point score flash — it will add 1000 points each time you hit it, but don't leave it too long or you'll crash.

My high score on *BeachHead* is 156,600.
Ivan Miller
Ireland

WE'RE STILL pondering whether to include a high-score section in *Fireworks*. Any comments?

Back-

answer

I REFER TO THE "overly" technique for Basic programs, described in *Answer Back* in August.

I tried out a pilot program on my Vic, and found that the new program would retain all numeric variables correctly from the old, but that with string variables the wrong string would frequently be returned. I would be most grateful if you could let me know how to overcome this program on the Vic.
John W Dunaway
Chicago
Illinois

THIS answer relates to all Commodore machines. If a string is defined in the text, then that string is taken from the text upon program execution. However, when you load another program that text is overwritten, and that pointer then calls apparent garbage.

When a string is created by the program, then the string

are stored in high memory, growing downwards from the top of Basic.

There are only four being overwritten by LOAD from within a program.

The answer to your question, then, is to redefine the string without changing it, and the redefined string will reside in high memory. For instance, if your program line reads 100 01="NAME", then after line 100 is read 100 01="NAME" will be 01="".

The "" adds a null, and has no effect on the length of the string.

Time, gentlemen...

I'M WRITING in reply to John Worin's problem with *Padquest*. When you get to the danger sign, throw your parking slab and continue north. After doing this you can return to the ramp, say something, and punch his title.

Ivan Jones
Ireland

IF THINGS go on like this, we'll have to start up an adventure column. What do you think...?

This is the chance to air your views — send your tips, complaints and compliments to *Letters Page*, Commodore Magazine, 12-13 Little Newport Street, London WC2E 8LD



Tymac all talk?

TYMAC TALKES back like making a big impact on the Commodore software market, when the gamers, which incorporate speech effects generated with no extra hardware, are released in the UK.

Tymac's style is as a manufacturer of precision engineering tools in the USA. From there the company diversified into home computer peripherals, and now a range of Tymac software is to be marketed by a UK wing.

Spokesman John Sage explained that the speech routines, developed specially by Tymac, add an extra dimension to the games without adding the cost of speech synthesis hardware. Moreover, Tymac's graphics routines are very impressive, especially on VIC 20 games like *Samurai*, an exciting martial arts battle game, and *Colossus Destroyer*, an underground escape mission featuring colourful perspective graphics.



Tymac's first release will be *Floor Fox*, which was the subject of negotiations with the US Gold label at one time. *Floor Fox* is a combat flight simulator in which you control a fighter assigned to defend civilians against enemy attacks.

Other forthcoming titles include *Castell*, a magical arcade adventure; *Pages*, based loosely on the scenario of the film *Clash of the Titans*; *Heat Battle*, a nuclear war simulation; and *Type-Writer*, a typing tutorial program which is actually fun.

Tymac games will be £14.95 on disk and £9.95 on tape. Contact John Sage, Tymac, Newton House, Calkeopy Road, Riphington, Birmingham, B43 8PP for further details.

CBM's spirit of adventure

COMMODORE'S new look-and-software arcade adventure *Spirit of the Stones* offers 40 prizes of jewelled "talismans", as well as the chance to win a share of the Royalty Fund based on the number of units sold.

The book on which the program is based is by John Worsley, and is set on the Isle of Wight. The supernatural adventure, involving struggles, mysterious events and hidden diamonds, offers clues to the location of the prizes on the Isle itself — but you don't need to travel to solve the riddle and find the treasures.

The book was released in the South of England six months ago, and already four of the jewelled prizes have been found. When the Commodore

book-and-software package reaches the shops in November, it will include extra



clues in the arcade game, which features a scrolling map of the island and 21 arcade

challenges showing evil spirits blocking your attempts to find the diamonds. The program is by Ian Grew, responsible for many of Interserve's most successful programs, and Lee Irvine.

Solving the arcade game reveals code letters which must be combined with the riddle clues in the book to unravel the mystery of the hiding places of the talismans and the Great Wight Eye.

The contents of disk-based package will cost £14.95, and 50p from each sale will be contributed to the Royalty Fund. The Fund will be divided with one share going to each finder of a talisman, and ten to the finder of the Great Wight Eye. It will be closed in 1990, or at £1m, or when all the talismans have been found.

Dynamite database

IF YOU HAVE a use for a 64 database program, but don't want to pay 58 or 60 pounds, Dynamite Software might have the answer with *Database 64*.

The tape-based program costs £7.99, and allows up to 32,000 records with 15 fields per record, 15 bytes per field and 255 bytes per record. The Database is menu-driven and contains on-screen help messages. Scrolling, save/load, add, insert, delete and amend are fully implemented.

Dynamite also offers a *64 Assembler/Disassembler* package, which allows variables, labels, pseudo ops and control commands. The disassembler will deal with any part of the 64's memory, including the operating system and Basic interpreter.

The Assembler/Disassembler costs £7.99 on tape, and comes with a manual.

For more details of these and other Dynamite packages, contact Dynamite Software, BCM 8719, London WC1N 3XX.

Vic on video

IF EVEN the best programming tutorial book leaves you in the dark, perhaps Master Class Video can supply some illumination.

There are four videos in the Commodore programming series: *Vic 20 Level One* and *Two* and *Commodore 64 One* and *Two*. Each of the one-hour cassettes is presented by David Rindoff, who demonstrates screen and keyboard techniques, data entry, and

more advanced programming techniques. As a bonus the soundtracks of the cassettes contain Basic programs which can be loaded into the computers. The video cassettes are available in Betamax and VHS formats, at a cost of £19.95.

For details of these and a range of other packages, contact Dynamite Software, BCM 8719, London WC1N 3XX.



Master Class video — there is no match

LVL in tune with Echo system

FOLLOWING last month's release of Commodore's Music Maker clip-on keyboard for the 64, hardware specialist LVL takes another approach with the introduction of the Echo 1 full-size mechanical keyboard.

The Echo-1 is a three-octave unit with a wood and metal case, costing £99.95.

Also available is an amplifier output kit, EchoKit, which enables you to connect your 64 to the DR-91 Enhanced amp/speaker unit. This

small, British dual cone device has volume and tone controls and a wooden cabinet.

The Echo-1 keyboard comes complete with a software package, *Organ Master*, which allows programmed and real-time control of the SID chip. Additional LefevreSoft packages are in preparation.

We hope to carry a full review of the Echo system in a forthcoming issue.

Contact LVL, Scientific House, Sandiacre, Nottingham, NG2 5A8DQ.



LVL's Echo system — play away on the 64

Oswald, Erik and Jim's adventures



Mosaic and Jim go off with Mosaic

MOSAIC PUBLISHING has announced three more "book-ware" packages based on best-selling paper-books.

The *Days of Erik the Viking*, by Mandy Fytton star and medievalist Terry Jones, contains a 64 program and a 20-page booklet. It's a new adventure programmed by Level 9, costing £9.95.

Harry Harrison's *The Stainless Steel Rat Saves the World* is an illustrated text adventure complete with a

copy of the hilarious ad-ri spoof paperback starring Slippery Jim McGrip, the galaxy's maddest con-man turned secret agent. Cost is again £9.95, as is that of *The Nomad of Time*, an illustrated text adventure based on Michael Moorcock's Oswald Bastable series. Programmed by Shards, *The Nomad...* comes with a 16-page booklet.

Contact Mosaic, 187 Upper Street, Ilford, London, E1 2JF 8JL8.

Mirrorsoft seeks the practical touch

MIRRORSOFT, known so far largely as a producer of games aimed at the young end of the market, has branched out into "practical software". The *Home Discovery* series is a suite of five programs for the 64 and other machines, and comprises a weight control program, "The Jolly Plan"; a "Know your Own Personality" package based on a book by Hans Selye and Glenn Wilson; "Know Your Own Mind", a psychic self-testing program by Carl Jung; "Star Seeker", an astronomy program developed in conjunction with the London Planetarium; and "Mastermind", the program of the

programic courtesy BBC-TV.

Most of the *Home Discovery* series has been written by Iain Berg Software, Cassette

versions will cost £9.95 and disks £12.95, and the packages will be available mail order from Mirrorsoft.



Home Discovery — M. Know Itself

Supabasic offers 72 extras

INTERCEPTER, best known for arcade games for the 64 and V10 20, has made an entry into the utilities market.

Interceptor Supabasic is a BASIC extension package adding 72 programming commands for the 64. Areas covered include hi-res graphics, sound, sprite control and programming aids. The package comes with a 40-page manual.

Supabasic sets a precedent by being available at the same price for disk or cassette versions — £9.95.

We'll be reviewing Supabasic in a future issue. Meanwhile contact Interceptor at Linden House, The Green, Tudley, Hampshire for more details.

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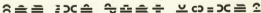
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Pulling the switch on Vic joysticks

Coffin Walls explains how to program the switch joystick

WHEN THE Vic 20 was first designed, it was intended primarily as a games machine. While it can be used for other purposes, the Vic is supplied with a selection of features with games in mind. One of the most useful and widely applied is the switch joystick. This is quite cheap, rugged and simple, but provides a versatile means of moving things around the screen.

The switch joystick is comprised of five switches, each of which, when closed, connects an output pin to ground (ie 0v, logic 0). One switch is connected to the "fire" button (often at the end of the stick). The other four switches correspond to the four directions of stick movement: "north", "south", "west" and "east". These four switches may also be operated in pairs, corresponding to the intermediate positions (ie north-west, north-east, south-west and south-east).

On the Vic, the joystick is plugged into the nine pin connector on the side of the machine. The pins are numbered left to right, top to bottom and used thus:

```
pin 1 - north
pin 2 - south
pin 3 - west
pin 4 - east
pin 5 - pin 9 (unused)
pin 6 - fire button
pin 7 - +1 joystick
pin 8 - 0VDD / 0V
pin 9 - pin 8 (unused)
```

Armed with this information, the software described below and a suitable plug (it's called a 9 pin "Cannon D" (female) in the trade), connecting any set of up to five switches to the Vic could not be easier.

Since the joystick is so useful and the hardware so simple, it's a shame that the designers of the Vic didn't make it easier to use from a BASIC program! Everything is OK if you just want to look for north, south, west and fire. These are connected to bit 2, 3, 4 and 1 of port A of VIA #1. This means that PEEKing 0117 (8A11) gives access to this data.

If you want to detect the joystick in the rest position, it's a bit of a problem. This

switch is connected to bit 7 of port B of VIA #1. This would simply be odd and a bit inconvenient, except that this port (all 8 bits) is used for output to the keyboard matrix!

To overcome this problem, it's necessary to change the direction of this bit to input temporarily by PEEKing a 0 into bit 7 of the data direction register (a pin a value of 127 into 0114, 8A12), before PEEKing 0117 (8A13). Don't forget to POKE the direction register back to 127 or you'll find that parts of the keyboard don't work! A side-effect of this rather odd design is that some keys (L, 4 and 0/00ML/CLR) behave oddly when ▶

FIG.2 - SIMPLE MACHINE-CODE JOYSTICK DRIVER, WITH LOADER

```
10 N=0
20 READM
30 IFN#""*M THENG0
40 M=M+1
50 GOTO20
60 RESTORE
70 A=PEEK(55)+256*PEEK(56)
80 A=A-N
90 AH=A/256:AL=AND255
100 POKE55,AL:POKE56,AH
110 POKE67,70
120 POKE674,AL:POKE675,AH
130 POKE251,N
140 CLR
150 N=PEEK(251)
160 H#=""0123456789ABCDEF"
170 A=PEEK(55)+256*PEEK(56)
180 FORL=ATON(A)-1
190 READM
200 H=0
210 FORI=1TO10
220 IFRIGHT*(H,I) > RIGHT*(H,I+1) THENH=H+1
230 IFLEFT*(H,I) < MID*(H,I+1) THENH=H+10
240 NEXT
250 POKE1,H
260 NEXT
270 NEW
1000 DATA0,7F,8D,22,31,AD,11,31,45,FF
1010 DATA9,3C,85,FB,AD,20,31,45,FF,23,0
8
1020 DATA5,FB,85,FB,45,FF,8D,22,31,00,4
1
```

FIG.1 - SIMPLE BASIC JOYSTICK DRIVING SUBROUTINE

```
ROUTINE
1000 POKE37154,127
1010 J=NOTPEEK(37137)
AND60:OR(ANDPEEK(37152)AND128)
1020 POKE37154,255
1030 RETURN
```



```

1000  *FIG. 4 - BACKGROUND JOYSTICK DRIVER (MK. 2)
1001  * USE LOADER AND INSTALLER FROM FIG. 3
1002
1003  1000
1004  1000
1005  1000
1006  1000
1007  1000
1008  1000
1009  1000
1010  1000
1011  1000
1012  1000
1013  1000
1014  1000
1015  1000
1016  1000
1017  1000
1018  1000
1019  1000
1020  1000
1021  1000
1022  1000
1023  1000
1024  1000
1025  1000
1026  1000
1027  1000
1028  1000
1029  1000
1030  1000
1031  1000
1032  1000
1033  1000
1034  1000
1035  1000
1036  1000
1037  1000
1038  1000
1039  1000
1040  1000
1041  1000
1042  1000
1043  1000
1044  1000
1045  1000
1046  1000
1047  1000
1048  1000
1049  1000
1050  1000
1051  1000
1052  1000
1053  1000
1054  1000
1055  1000
1056  1000
1057  1000
1058  1000
1059  1000
1060  1000
1061  1000
1062  1000
1063  1000
1064  1000
1065  1000
1066  1000
1067  1000
1068  1000
1069  1000
1070  1000
1071  1000
1072  1000
1073  1000
1074  1000
1075  1000
1076  1000
1077  1000
1078  1000
1079  1000
1080  1000
1081  1000
1082  1000
1083  1000
1084  1000
1085  1000
1086  1000
1087  1000
1088  1000
1089  1000
1090  1000
1091  1000
1092  1000
1093  1000
1094  1000
1095  1000
1096  1000
1097  1000
1098  1000
1099  1000
1100  1000

```

4 the joystick is in the east position (try it).

Figure 1 contains a simple BASIC sub-routine to drive the joystick. On return, the variable J contains bits set as follows:

```

100  J = 0
101  J = 0
102  J = north
103  J = south
104  J = west
105  J = 0
106  J = 0
107  J = east

```

Hence, the following values may result:

```

0 = centre
4 = north
8 = south
16 = west
32 = east
64 = north-west
96 = north-east
128 = south-west
160 = south-east

```

adding 32 if the fire button is pressed.

The program in Figure 2 loads a machine-code version into the top of memory (see size). This is faster and more compact than BASIC and may be invoked by:

```

SYS 60 : J = PEEK(210)

```

It's worth noting that, if you abort the BASIC program using RUN/STOP, it's possible to end up with a partly disabled keyboard type RUN/STOP-RESTORE to cure it. With the machine-code version, this can't happen.

Although the above technique does simplify driving of joysticks on the Vic, it still isn't as easy as with some other computers. With the 64, for instance, it's only necessary to PEEK a location to read the joystick position. Can it be made this simple with the Vic?

The answer is "Yes", by implementing a "background" program. Such a program is run every so often, independently of any BASIC program being run at the time. The Vic scans some code every 60th of a second to update the time, scan the keyboard, flash the cursor etc. Fortunately, the Vic operating system is designed such that an alternative program may also be run at this frequency. I have included two variations on this theme.

```

FIG. 4 - BACKGROUND JOYSTICK DRIVER (MK. 2)
1, USE LOADER AND INSTALLER FROM FIG. 3
1800 DATA9,7F,8D,22,91,40,11,91,49,FF
1810 DATA25,3C,85,FB,4D,39,91,49,FF,29,9
1820 DATA98,FB,8B,83,91,2D,8B,FF
1830 DATA8D,22,91,4C,8F,EA,xx

```

```

FIG. 5 - KEYBOARD EMULATION JOYSTICK DRIV
ER, USE LOADER AND INSTALLER FROM FIG. 3
85 N=N-22
148 FORN=67370694
825 DATA19,91,11,1D,8D,88,88,88,88
1800 DATA98,7F,8D,22,91,40,11,91,49,FF
1810 DATA25,3C,85,FB,4D,39,91,49,FF
1820 DATA29,88,85,FB,85,FB,49,FF,8D,22,9
1
1830 DATA98,88,85,FB,29,28,08,2D,85,FB
1840 DATACB,C9,84,FB,26,C9,C9,89,FB,21
1850 DATACB,C9,88,FB,1C,C9,C9,18,FB,17
1860 DATPCB,C3,84,FB,12,C9,C9,14,FB,8D
1870 DATPCB,C3,88,FB,88,C8,C5,18,FB,83
1880 DATACB,8F,EA,88,8E,82,8D,77,82
1890 DATA98,81,85,C8,4C,8F,EA,xx

```

The program in Figure 3 loads a background program which scans the joystick and places the result in the form used in the program in Figure 1) in location 210376. So, to read the joystick use:

```

J = PEEK(210)

```

at any time.

The alternative loaded by the program in Figure 4 places the result in the first variable defined by the BASIC program (which should be an integer). For example:

```

A:76 = 0
20 PRINT J%
30 GOTO 20

```

prints the joystick value continuously on the screen.

The sound of the two variations has the advantage of speed, since an integer variable access is faster than a PEEK, in both cases the background program is killed by RUN/STOP-RESTORE. They may be re-instated by SYS 61.

At least one other computer it won't say which, but suffice it to say that it's not a Commodore has a joystick interface combined with the keyboard scanning circuitry. This means that the joystick may be driven like the keyboard, it will GEM!

The program in Figure 3 loads a background routine to achieve a similar effect. The nine values in the DATA statement in line 975 represent the ASCII in CHR\$(code) corresponding to fire, north, south, east, west, north-east, north-west, south-east and south-west, respectively. The fire button takes precedence over the stick directions. With the given values, the joystick moves the cursor around, using north, south, east and west, by scanning the cursor limited keys.

This approach is really my favourite. The main advantage is that programs may easily be written to use the joystick or keyboard with no conversions. It would, therefore, be simple to add joystick control to a program written to use the keyboard. Again, the background program may be killed with RUN/STOP-RESTORE and revived with SYS 87.

I mentioned earlier that any five switches could be connected to the Vic using the joystick interface. This is quite a useful technique since a 5v power supply is also available on the same connector. It may be made even more flexible by providing some logic outputs.

This is simple, because the VIA may have its connections configured by software to be inputs or outputs, in any combination. This is only possible with the four connected to VIA #1, since the other bit is only "borrowed" from the keyboard, when required. The program in Figure 4 codes all four bits (ie pins 1, 2, 3 and 4 of the connector) between logic 0 and 1, with a period of about a second. ■

```

FIG. 6 - JOYSTICK 'OUTPUT'
DEMONSTRATION PROGRAM
10 POKE37139,80
20 POKE37137,80
30 FORI=1TO500:NEXTI
40 POKE37137,0
50 FORI=1TO500:NEXTI
60 GOTO20

```

On the wing



A flight simulator for people who can't stand flight simulators. Having attempted the impossible Strategic Flight Simulator 2, and plunged into the ground many a time with Digital Integration's Flightline Pilot, I'm just as relieved to appear to see a flight simulator stripped of its complexities.

In *Wing Commander* you must pilot your plane in a combination with enemy battleships intent on destroying important civilian and military targets. With the help of a radar map, a cleverly-represented scanner, and various on-screen altitude, condition and warning displays, you can get the handles in your sights and have the pleasure of blasting them out of the skies.

Not too complex graphically, but a great game to play at Christmas. Really good for younger players, and not bad for old grunted ones like me.

Program: *Wing Commander*, 64

Supplier: Creative Sparks

Price: £1.95

Graphics: ★★★★★

Sound: ★★★★★

Compatibility: ★★★★★

Puffed out?



Puffin's Fighting Fantasy gamebooks have made a fortune for authors Ian Livingstone and Steve Jackson, and have made me very jealous. I had the idea years ago, but they beat me to it! You take on the role of a fearless adventurer, and with rolls of a die and choices selected from a small menu, you make your way through the adventure, either achieving your end or meeting your doom along the way.

The books are excellent, but it is a weakness to the Puffin software packages that they stick too closely to the same format. This means that you have to wade through masses of text before you come to the point where you have to make a decision,

Soft *Hits*

*Purishing the pixels
and bashing the bytes
of all the new games*

and even when you make a choice all that really happens is that you see a mediocre picture of your avatar and watch simulated dice roll.

If you've got the books, the software doesn't add much to the fun.

Program: Puffin Fighting Fantasy Software

Supplier: Puffin Books

Price: £5.98 tape, £6.95 with book

Graphics: ★★★★★

Sound: ★★

Compatibility: ★★★★★

Carted away



This could have been a good idea, but Activision must get used to the idea that the general standard of computer games should be much higher than that of videogames. In this one you pilot a fighter-bomber, seen from above as it makes its way along a narrow valley. Bridges must be knocked out, tanks and enemy fighters avoided or capped, and various hazards such as balloons and helicopters dealt with.



Not much need to explain in depth the deeply wonderful style of the illustrations Tony Crowther, proprietor of Mandy Mob, Posty Pigeon and Blagger-In fact *Sable Express* is derived from his *Alligata* game Lane, but is ten times better — faster, more violent and graphically

You can start at any point in the game, and there are various skill levels. You must duck as fly over bad drops to reflect — a bizarre and illogical game feature, it's always weird to me — and that's about it.

This is one case where although the game is enjoyable to play, it's despite the graphics and sound, which are rudimentary, rather than because of them.

Program: *Sable Express*, 64

Supplier: Activision

Price: £9.95

Graphics: ★★★★★

Sound: ★★★★★

Compatibility: ★★★★★★

Gnurds



It's a long time since Tanker introduced a game, though they seem to have weathered the long, hard summer well.

Poster Poster isn't their best, but it's still way ahead of many competitors.

Bill Slickers, *Poster Poster* extraordinaire, must manoeuvre ladders, poles and gloop through the streets of — *Bullington?* — flicking past at attacking Gnurds, Wazooks and Drain Brains. The difficult bit is climbing the ladder and wricking your bit of poster up in the right order. There's a brilliant ascending effect as the poster hangs half, and having achieved one success you have to move on to the next one.

As is usual for Tanker, great graphics, whacky music and a bizarre sense of humour. Watch out for *Seaside Special*, too — it promises to be even better.

PS — Gnurds look like toadpots — or are those the Wazooks?

Program: *Poster Poster*, 64

One-way ticket to doom

warning.

You guide a futuristic monorail car along a complex of tracks, fighting off attacks from exploding droons, fighter ships and marivols involving flying saucers. Incorporating music by Six, software-generated speech and sippy sound effects, *Sable Express* scores ten straight along the line. If you can think of a good reason not to buy this one, I'd jolly well like to hear it.

Program: *Sable Express*, 64

Supplier: Graphic Graphics

Price: £9.95

Graphics: ★★★★★★★★★★

Sound: ★★★★★★★★★★

Compatibility: ★★★★★★★★★★

Supplier: Taskart, 13 High Street, Buntingford
 Price: £6.99 on cassette, £9.99 disk
 Graphics: ★★★★★★
 Sound: ★★★★★★
 Gameplay: ★★★★★★

Nest is best



This one was a winner when it came out on the Spectrum, but like so many other games seems somehow disappointing on the 64.

The 3-D effects are good, depicting a mysterious, ruined city inhabited by marauding ants. You can choose your point of view, switching from one angle to another so that you never lose sight of the protagonists as they roam the city. You can also choose your sex, which is a pleasantly gimmick from the point of view of the two or three girls who play computer games.

Armed with grenades you explore the city, searching for your beloved and bombing the ants. The Spectrum version of the game contained all sorts of surprises — hidden ammunition caches, secret rooms and so on — whether the 64 version has the same, time alone will tell. Certainly worth having, though not an outstanding new as it might have been had it come out 6 months ago.

Program: Ant Attack, 64
 Supplier: Quicksilver
 Price: £8.99
 Graphics: ★★★★★★

Around the horn



Jumping Jeff strikes again. As Anaxipolis is a post-World War II business-land, Anaxipolis is a post-World War II business-land. In this case your little spirit must negotiate a 10x10 maze inhabited by the usual boring collection of badies, in search of the six Key Cards and the six Coats of Power. Depicted as "an adventure for

Snappy ★★★★★★
 Gameplay: ★★★★★★

"Ello, 'ello!"



PC Price is a surreal arcade romp featuring a soccer on a unicycle, flinging guided trenchcoats at masked robbers planning to spirit away the loot tied to balloons, while punks on popo sticks bounce through the streets trying to knock our hero off his unicycle, and getaway cars and drunken citizens weave around just to confuse matters further.

If that's the kind of game you like — you'll like this one!
 Program: PC Fuzz, 64
 Supplier: Axiom
 Price: £7.99
 Graphics: ★★★★★★
 Sound: ★★★★★★
 Gameplay: ★★★★★★

Snappy



Altera has been responsible for the lots of good stuff, but having lost

Temp Crowther (of great renown), Rocket Rager looks comparatively limp. It isn't though — it's well worth checking out. It's all the usual business — spaceship with jetpack and laser gun, flying through a treacherous landscape avoiding laser beams, sliding doors, flying enemies and invisible force fields. Your aim is to collect fuel crystals to recharge your spaceship, and if you delay too long between crystals you'll take a long tumble.

There are 99 crystals to collect, so Rocket Rager should keep a few people busy for the months to come.

Program: Rocket Rager, 64
 Supplier: Alliance
 Price: £7.99
 Graphics: ★★★★★★
 Sound: ★★★★★★
 Gameplay: ★★★★★★

Green Light



A lovely simple idea: control traffic at a London intersection by using the cursor to enter which set of traffic lights to change. Too much of a holdup at any point and you lose.

Multi-level, nice graphics made and uncomplicated graphics, probably best for younger children. I'm convinced it's a major contribution to road safety.
 Program: Traffic, 64
 Supplier: Quicksilver, Palmerston Park House, 13 Palmerston Rd, Southampton.
 Price: £7.99

Graphics: ★★★★★★
 Sound: ★★★★★★
 Gameplay: ★★★★★★

Genuine



The original and genuine, and in many ways a disappointment compared to Dynavision's Haven.

As you will know from countless rip-off versions, Zaxxon features a 45 degree perspective scrolling landscape, over which your fighter flies, with full left-right-

up-down control from the joystick. Guided missiles, gun emplacements, laser fields, space fighters and rockets attempt to blast you out of the sky as you make your way through ever more difficult obstacles to finally confront the Zaxxon robot. It's all jolly good fun.

Though this version is probably as close as it's possible to get to the original graphically, the sound effects are poor. But if you want the genuine article, this is the one to go for.

Program: Zaxxon, 64

Supplier: US Gold

Price: £9.99

Graphics: ★★★★★★

Sound: ★★★★★

Gameplay: ★★★★★★

Vroom ...



Limbic Systems, spin-off from IBM, has fully-embroidered Oxford Computer Systems. Turbo 64, our race game similar to Atari's Pole Position, only no other cars on track. Software protection system, very annoying. Requires you to hit joystick at right time when screen displaying certain colour checked against special numbered grid on insert. Nice sound effects in the intro sequence, which seems to go on for ever. Not much else to say really.

Program: Turbo 64

Supplier: Limbic

Price: T.B.A.

Graphics: ★★★★★★

Sound: ★★★★★

Gameplay: ★★★★★

Magic!



Voyage's corporate suits have certainly been pulled up. This latest offering, though hardly stunningly original, is fun, whacky and very polished. As the last surviving magician fighting the evil sorceresses, you must roam the land collecting various weapons, spell books

and potions before confronting the huddle at Stonehenge. Energy, location and inventory are given at the bottom of the screen.

Some colourful graphics as you navigate the 17 screens, super spooky music and sound effects, and an important element of strategy which makes Sorcery much more than just another multi-screen arcade game.

Program: Sorcery, 64

Supplier: Virgin

Price: £6.99

Graphics: ★★★★★★

Sound: ★★★★★★

Gameplay: ★★★★★★

Ugh! slug bugs



A stepped out of all possibility of anticipation from an Atari original, Jaws Jim should give a few players late nights.

Although it's basically simple — a jungle explorer hopping around a grid of squares, uncovering treasure and avoiding voodoo-creatures — it's the little details that make this game so satisfyingly complex.

Collecting treasures allows Jim to trade for pieces of a magic boat, and it's the compulsion to complete this vessel that gives the game its playability.

What will make Jim negotiate, Slug Bug to avoid and black holes to fall into, Jaws Jim's got the lot. Give it a try.

Program: Jaws Jim, 64

Supplier: Creative Sparks

Price: £7.95

Graphics: ★★★★★★

Sound: ★★★★★★

Gameplay: ★★★★★★

Cave man



The latest from Bubble Bus is not overwhelming original, but features a few good bonuses (if you see what I mean) and new title music (Charlie of Fine).

There are 10 screens to explore, and it's the usual business of climbing ropes,

snapping man-eating plants and flying goodies, and sticking within the time limit for each one.

Unusually, the number of lives you start with can be set from 1 to 99, and you can start at any cave at a variety of skill levels.

Not a classic, but well worth checking out for those of you who like a game which certainly can't be defeated in a single sitting.

Program: Cave Fighter, 64

Supplier: Bubble Bus

Price: T.B.A.

Graphics: ★★★★★

Sound: ★★★★★

Gameplay: ★★★★★★

Jolly Wallie



Yet another of the Music Mole/Miner Wally/Leo Set Sloggers stable, but an excellent game for all that. Trellis Wallie, who looks like a carnivorous jaffa's orange on legs, leaps around a whacky super-market collecting goodies and avoiding poisons. Every five items he must go back to the checkout to unload.

Hidden lovers open doors and vicious weebies flip around menacingly. Best of all, though, there is a great music score featuring Popcorn and Jose-Michel Jero's greatest hits.

Good scrolling and a large playing area. A must if this sort of game is your bag, or if you like good soundtracks.

Program: Trellis Wallie, 64

Supplier: Interceptor, Linton House, The Grove, Tadley, Hants

Price: £7 coin, £9 disk

Graphics: ★★★★★★

Sound: ★★★★★★

Gameplay: ★★★★★★

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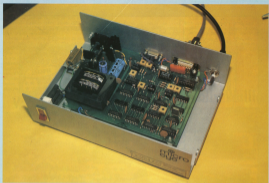
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Splitting Images

VIDEO DIGITIZING systems, which allow the output of a video camera to be transferred to a computer screen, have been around for many years now, but mainly in the guise of research projects or very up-market graphics systems. Digitizer has now produced a version of its Microight I system which interfaces with the Commodore 64, and which (depending on your affluence), is within reach of home users as well as professionals. The digitizer costs £200, but if you have your own camera, you can expect to knock £100 off the price.

The system supplied for review consisted of a video camera and tripod, the interface box, connecting leads, manual and software. The camera is a black and white TEC Bergant 40 model, if the name of the manufacturer is unfamiliar to you, then it is worth mentioning that many broadcast organisations use Bergant hand-held cameras, affectionately known as "Bikkies". The model 40 is at the other end of the range, however.

It contains a Vidicon picture tube and is fitted with an 11.4 lens with a minimum focusing distance of 18 inches. The electronics handle the signal levels, so in order to obtain the best contrast range, it is only necessary to adjust the iris. Although this sounds like an advantage, it would help if gain and black level were adjustable. The connections to the camera are a mains supply and video lead — a BNC-type socket feeds the interface via a supplied lead.

The sturdy aluminium box containing the interface electronics, called Microeye, measures 10 by 7 by 3 inches and has one external control — which is only a power switch. A D-type socket carries digital

signals to and from the box, and mains must be supplied via the Entology connector, inside the box. The quality of construction is high, with all but one power supply resistor mounted on a double-sided circuit board. The majority of the active components are TTL chips, but at the heart of the interface is an analogue-to-digital converter IC.

Connecting the interface to the Commodore 64 is achieved with a cable that plugs into the user port. But, the lead provided with the review package could be plugged into the computer upside down, as no polarising lugs were fitted. On a prototype system this is forgivable, and it will only cost a few pence to correct.

Describing the manual and software that will come with production systems is difficult, since we were provided with pre-production copies. The prototype software was supplied on disk, but production software will be provided on cassette, with the leadkey for making disk copies. The manual consists of 30 odd pages bound in an A4 folder, but more related to an earlier system for the PET, with a few pages referring to the 64 version. If the final result is as comprehensive as the PET manual then it will be quite adequate, though not designed for inexperienced computer users.

The way that the system works is both interesting and clever. For readers who are not clear about the make up of a video picture, I will give a brief summary, as this is required knowledge if you want to understand how the Microeye functions. The signal produced by a video camera is a series of lines of picture information interspersed with negative-going synchronising pulses. First comes a long pulse that indicates the start of a new field, then a few pulses signal the beginning of each line of video brightness information.

Communicating top left, the image is built up a line at a time from this data. Each line takes 64 microseconds to scan and 287 (and a half), but lets forget about that!

lines to build up one field, which takes a fifth-of-a-second including the field pulse. A second field is required to make up a full video frame. The low information comes from between the first set of lines, this method being called interleaving.

When the Microvax interface receives a reset signal it waits for the beginning of the next frame. When this arrives, the A/D converter is fed the brightness level of the beginning of the first line of the picture. This is converted to a parallel digital signal that is then passed to the rest part of the computer, where software handles the information, storing it for later use. Note that up to 8-bit data is available, giving 256 different levels, but only four bits are stored by the computer, resulting in 16 different levels. One dot of picture has been stored, but this takes time, and by now the video signal is giving values from much further along the line. The interface therefore waits for the next line pulse and repeats the process on the first dot of the second line, then the third, fourth and so on. Finally, 128 dots having been stored, the rest of the field is ignored.

When the next field arrives, which is vertically interlaced because of interleaving, but close enough for these purposes) does an examination and stores in the same manner as before. The only difference is that the sample of video brightness is taken from a line further along the line.

After the second field has been digitized, therefore, the computer has two adjacent rows of dot data stored, corresponding to the first two left-hand pixels from each line. The data continues — each field is processed until a full width picture has been stored, consisting of 256 by 128 pixels, each recorded to 4-bit accuracy.

Limited resolution

It is at this point that I must admit to misleading you. The description of the interface does not take into account the limited resolution of the 64. "What?" I hear you cry. "The 64 has a very high resolution." I agree, but not quite enough to handle 256 lines and include some form of grey scaling. The software for the 64 varies upwards alternative pixels and ignores some at the bottom, giving 180 pixels vertically, and also does not touch with every other field, so the horizontal resolution is 128.

So much for the theory, how well does it work in practice? With a few reservations, the answer is "very well". Once I had hooked the system up to the computer, I loaded the software from disk. The first step is to load and run an initialization program. This puts a good deal of machine code into place and then asks if you have a disk or tape system. Once you reply, the second program automatically loads from the correct source and runs.

After another delay, for more machine code installation, the 64 switches on the high-beam mode and clears the screen. You now need to refer to the instructions again to do prompts appear on the screen, but operating the software only involves the function keys.

F1 reads in an image from the interface. The VRC chip is switched off, so that the CPU is not slowed down and timings are more accurate. For five seconds you are presented with a blank screen, while the data is gathered, and then a 128 by 180 picture is drawn in the bottom left hand corner of the screen. This is a binary image, with no grey scaling, and only takes a few moments to produce.

It is at this point that I realized that adjusting the camera was going to be a rather long-winded task. So, to speed things up, I looped the video output through the auxiliary input of a VCR, allowing me to view the camera image on a TV and adjust it quickly. Once it was exposed, reasonably precise work coming from the camera, the results of processing F1 were most encouraging. The image data is only read in by this one function, and is stored in a 12K table.

It is this stored picture that is displayed by pressing F3 — the mode for reproducing a larger, shaded display. The display is now the full screen width, as the 128 pixels are stretched in width, and that leaves 64 of the computer's 128 available pixels with nothing to do.

First results of using F3 were impressive, but could be improved with the aid of the third function, F2. This allows the user to adjust two variables used to produce the image. Threshold can have any value between 0 and 255 and affects the overall density of the picture. Increasing this value gives a darker image. Contrast affects the spacing between shades of grey, and can have a value between 0 and 255. Pressing F2 returns you to the test display, where the computer prompts you for new values.

At this point a bug in the software raised its ugly head. Even when inputting what I thought were valid values, the software occasionally stopped with an "Illegal Quantity" error message. This would now have been too disastrous if I had been able to restart the program, but word of the machine code must have been corrupted by the error, so each time the bug appeared I ended up reloading the program. Digibourse points out that the

software is still in the prototype stage, so I'm sure this will be sorted out.

When the values are accepted, you are given a quarter screen view of the effect of changing Threshold, and F1 will then display the image using the new variables.

The final function, F7, will output the large picture to an Epson-type printer using bit-binary graphics. Without the correct printer, I was unable to check the results. This is the only way, apart for photography, of preserving your masterpiece as permanent. I am assured that the final version of the software will include a tape and disk save and recall function, and that it will also be possible to "export" the image to one of the graphics handling packages for further improvements.

Lighting problems

Problems? Lighting 3-D objects so that they are very evenly illuminated and have a narrow contrast range requires time to experiment. With a stored contrast range of 16 to 1 and a displayed range of 8 to 1 much experiment was involved in bringing out details. Two-dimensional images were fairly easy to store if you only want coarse results, but if grey-scaling is desired then careful selection of subject matter is necessary.

A secondary problem was caused by the camera supplied, which suffered from shading in the corners. The system does not sample the whole frame — the bottom of the frame must be omitted because there are too many lines in a standard video signal, and the width must be controlled accordingly to maintain the correct input ratio. The solution of this is that the camera shading in the top left corner is compensated, and often proved impossible to "light-out".

Another piece of software that will also be available with the system uses the multi-coloured bit-mapped mode of the Commodore 64. Therefore, colours will replace the bit-binary method of reproduction, with the choice being left to the user. In fact, the software situation is so really a question of demand. If you are unable to change what is supplied to meet your exact needs then Digibourse may well be able to help.

One experiment which I tried was taking a still frame from a video recorder. My particular machine does not provide a very stable frame, and yet the results were passable.

The hardware part of the system presents some very exciting possibilities. With the right software, Microvax will be able to carry out many practical tasks, and those users with sufficient money will find the system a fascinating and absorbing addition to their Commodore 64. ■

Jeff Maylor



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Red Victor Leader Bandits 2 o'clock high

Chris Jenkins interviews Steve Lee, author of *Falcon Patrol*

WHEN WE talked to Steve Lee in luxurious Sunshine Towers he was going through a period of enforced idleness.

"I've just moved house, and the builders are still working on the estate. Every time they re-up their diggers all the fences blow, so at the moment my 64's out of action. I'm spending the time fishing!"

In fact, Steve finds that working as a full-time games programmer has its ups and downs. "The neighbours can't make me out — I get some very funny looks when I tell them what I do. They assume because I'm around the house all day that I'm just idle."

It was another period of enforced idleness which encouraged Steve to become a programmer in the first place. "I had a computer science A level — the only one of three that I was any good at — and my earliest experience with computing was using a Z801. I later moved on to the Vic 20, and started writing games because I was interested in graphics. Unfortunately, I was made redundant, so with nothing better to do I tried writing some games . . . the first was *Tornado*, to *Quickdraw*."



Steve's early efforts *Tornado* and *Shipbank* were written using the Viccom cartridge, without the benefits of a printer or disk drive. "Everything was written down on paper," Steve recalls, "but I was very pleased with the results. My next game, *Missile Warfare*, included a "split" routine on the unresponsive Vic. That's its main claim to fame. It was very much a version of *Linear Broom* — all the games have had one — and Virgin offered me a contract based on it. By that time I'd got hold of a 64, one of the first in the country, and I was learning how to use it, which was hard work because I didn't have full documentation. But working that way I got to know the machine very well."

Steve's first 64 game, *Falcon Patrol*, became an instant classic, and set a precedent for 'Virgin Games' — people

actually liked it. "When Virgin went into the games business people accused them of copying their products, because they were a record company. I don't think it was over that bad, and in any case the situation's quite different now — if you look at the ads you'll see that they're purely descriptive, none of this 'mega-game' and 'synergy' stuff."

Falcon Patrol was shown with great success at the American Consumer Electronics Show, and went on to become one of Virgin's best sellers. "In fact, although I haven't made a fortune from programming, *Falcon Patrol* did finance my move to the new house. Now that Virgin have cut the price to £2.99, they're selling huge quantities mail order, and I get the same payment from a £2.99 mail order sale as I would from a £8.95 shop sale."

Falcon Patrol is arguably a *Breaker* variant, but there are crucial differences. Firstly, the background is so detailed that the game is worth seeing just to watch it scroll by. Secondly, there is a certain amount of strategy involved in using your radar display to creep behind the enemy fighters and blast them before they can blast you; then in landing to refuel and re-arm before the next wave comes along. "I wouldn't write a straight shoot-'em-up without an element of strategy," says Steve, "it just wouldn't interest me."

If there was a problem with EP1, it was that you can't dodge around changing enemy fighters for long minutes without watching them, just running out of fuel and watching the landscape scroll by. However, it incorporated the sideways scroll techniques from *Tornado*, and the attention to detail here of Steve's interest in graphics, *Falcon Patrol* made a big hit. Virgin considered ideas for a sequel immediately, but Steve's next effort was on an entirely different track.

"I wanted to do a maze game, but I also wanted to add an element of humour to offset the violence! So I came up with *Hidokus Bill* and the *GI-Guns*."

Hidokus Bill is a sort of anti-hero version of Indiana Jones. "In another context he could be a wally," says Steve, "but I like him, I might even see him in another game. In fact he's based on a mythical character from my youth. A bunch of my friends had T-shirts printed up with 'Hidokus Bill Lee' and so on — we were all *Hidokus Bills*, I had been playing around with a spirit editor package, and came up with the image

of an ant. It was just one of lots of ideas — I'd like to do something involving skeletons — but it was the basis of *Hidokus Bill*."

Hidokus Bill's history is well-documented in the game's lore, written by Steve's brother. In this adventure his mission is to rescue his beloved Gena from the clutches of the GI-Guns. In the first screen he had to circumnavigate a maze, smashing eggs and avoiding the ants. In the second there are hidden levers which must be picked up in order to open the door to the next level, and a can of baked beans which restores Bill's strength. The third screen is a spiral which Bill must traverse by knocking holes in the wall with his head, so that he can take refuge from the marauding ants. Should he rescue Gena, there's a three-minute cartoon sequence which ends with the unfortunate girl being kidnapped again, and the whole thing restarts. *Hidokus Bill*, hero of the game Steve has written for this month's issue of *Computer Games*, may return in Steve's next game, but for the moment let's leave him to the ants.

Steve's latest production is *Falcon Patrol 2*. "We thought for a long time about how we could do a sequel. I designed the background, which was substantially the same as the original, but with more detail. Then one of the other programmers on Virgin's team looked at it and enlarged the scale of some of the buildings, and added the graphics . . . it now looks quite different to my original design. I now have things like the title screen and the high-score screen worked out, so there wasn't much effort required on that side of things. My brother Dave wrote the music. We set a



TEAC Fortimaths and a **Barg Menu Poly** to work out the tunes, then I use *Speedy 4d* and a routine I've written myself to dump the music data into my program. One thing you'll get to say about the 64 is that the sounds are better than the graphics.



although the filters on the SID chip can be a bit unreliable."

A lot of work on *Falcon Patrol 2* went into the sprites. "I didn't use bit-map mode because it uses up a lot of memory. The



background is all user-defined graphics, and the helicopters and flak are sprites. You'll notice that the flak batteries sometimes stop firing when the helicopters appear — this is because I've stolen the sprites. Games like *Harving of the Wheat* and *Camels* use only right sprites, though it looks like there are more. I experimented with counters to create more sprites — you could have 250 quite easily, but due to the interrupt structure they could only move horizontally. This would be all right for a game like *Frogger*, but not much good in something like *Falcon Patrol*.

"I tried to write a routine which would use 18 sprites, using just the standard eight by turning them on and off with the interrupts. It didn't work out because the results were too flickery. On the Spectrum you can define any number of "sprites" you like, but the problem with the machine is the colour clashes.

"Another idea I experimented with on FP2 was tanks on the ground, but the specific requirements with the sprite priorities made it all too complicated. I'd rather take a few ideas to their limit than try to cram in too many, so I just used the ground-based flak batteries and radar jammers.

"The tactics for FP2 are quite different to those in FP1; you can't just come up on the enemy from behind. The helicopters move more randomly. In fact there are 32 variables between levels — some of them are quite subtle, others more obvious, like the height at which the flak batteries can hit you. At levels 8 and 9 there's a lot more flak — you can just about ignore it in the early levels.

"I'm not much of a games player — the highest score I've got on FP2 is 4000. I'm just not motivated I suppose.

"My brother Robert designed the aircraft in FP2, and the way it banks and turns. Since I don't see many other games it's a great help to have the opinions of my brother and the other Virgin programmers — they see and play everything going. I like a few games — I bought a Spectrum just to



COMMODORE 64 JUSTICE CONTROL

play *Fighter Pilot*, and I like *International Soccer* and some of Jeff Minter's games on the 64. But I couldn't write something like Virgin's Spectrum game *Strangeloop* — it just wouldn't hold my intense screen after screen. I've got lots of ideas, though, that might be suitable for one of the Virgin programmers — something about lumberjacks trying to keep the logs from blocking the stream, or another idea I had was a steam engine simulator, just like a flight simulator only with a piston and boiler and so on."

Though Stone's seen the new Commodore machines, he doesn't regard them as games playing machines. "I use my 64 for some business applications. Paperclip helps me to do word processing, and even accounts and spreadsheet work. The Plus/4 might do a good applications machine, but Commodore might do better off dropping the price of the 64. They'll certainly have to consider doing that in the case of the C16, if it's to compete with the Spectrum. The 64 would be just right if the price was a little lower, and if it had better colour resolution. I think ideas like speech synthesis hardware are basically good, but they need a unit base before the software houses will take it up. Speech software is good in principle, but you need around 3K per second for reasonably intelligible results — the memory just isn't there.

"I wouldn't break into a game to look at how it's written — frankly there aren't that many I'm interested in, usually I don't like the idea. I think it's the originality of the concepts that makes all the difference. That's why my next game is going to be really unusual — no rapping, no simple single quest, the aim isn't even just to smash points. There are going to be seven or eight characters, one of which the player will control. There's an interactive element, with the other characters trying to stop or help you as you do the job you've set out to do. I think I'll be able to use 40 or 50 screens with a reasonable amount of detail, using some elements repeatedly in different combinations. The main feature is going to be the graphic effects, with scenes and dissolve like in a film. I don't know what you'll call it — it's neither an arcade game nor an adventure — it's probably not even a game at all!

"I work when the mood takes me, sometimes for up to 12 hours at a time. If I don't feel like working I get overwhelmed by guilt eventually and I get back down to it, but it's no good trying to force an idea — some-



thing always turns up if I give it long enough.

"Malcolm Bell might be the hero of the new game, or maybe not — we'll have to see how it goes. Working with the Virgin team there are always new ideas coming from all directions." ■

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New users — start here!

If Santa brought you a Commodore 64 or a Vic 20, you might find yourself sitting in front of your TV watching the cursor flashing, with no idea what to do next. Sarah Corbett explains the basics of BASIC, and sets you on the road to programming success.

If YOU are baffled by your Vic20 or Commodore 64 then this article should be of some assistance. It covers several basic principles of using your computer in an easy to understand way.

When you turn on your computer you will see a blinking square on the screen. This is the CURSOR, which tells you where the next letter will be printed. You can move it about the screen using the keys in the bottom right-hand corner of the keyboard marked CURR. The left-hand one will make the cursor move directly downwards, but if it is used in conjunction with one of the shift keys the cursor moves up. The right-hand key controls horizontal movement and again can be used with the shift key.

You can easily change the colour of the cursor. If you type in a few letters you can see that they appear in the same colour as the cursor. To change colour hold down the CTRL key along with one of the numeric keys. You will notice that the first three letters of the colour are shown on the vertical sections of the keys: BLK—black, PUR—purple, WHI—white, GRN—green, RED—red, BLU—blue, CYN—cyan (light blue), YEL—yellow.

The Commodore 64 also has 8 additional colours, which can be accessed using the Commodore logo key at the bottom left-hand corner instead of CTRL.

Clear

As well as changing the cursor, you can also alter the colour of the screen and border. For the Vic20 type the following and then hit the RETURN key:

```
POKE 16384. This will give you a completely black screen. Other combinations can be found on page 134 of the supplied manual. On the Commodore 64 you will need to type two lines, each followed by the RETURN key. Firstly type this:
```

```
POKE 52284
```

This will give you a black border. Now try this:

```
POKE 52285
```

The numbers of the other colours are on page 66 of the user guide.

For both computers you can get back to the original colour by holding down the RUN/STOP and RESTORE keys together.

Try typing in words and graphics until the screen is full. On the vertical faces of most of the keys you will see the "PET graphic characters". To obtain these on the left, use the Commodore log key, and for those on the right employ one of the shift keys. If the screen gets a bit cluttered up hold down the CLR/HOME key and shift simultaneously. Without the shift key this will return the cursor to the top left-hand corner.

Make sure that you know where the RETURN key is, as you will be using it a lot in the future. It is employed to enter instructions or information.

To get your computer to work you will need to write a "PROGRAM" which is really just a set of instructions. This

Program 1

```
10 PRINT "HELLO"
20 GOTO 10
```

Program 2

```
10 PRINT "HELLO"
20 PRINT 12
30 PRINT 12*3
40 PRINT 12/3
50 PRINT 3+3
60 PRINT 3-3
70 PRINT 3-3
80 PRINT 12*3
90 PRINT 12/3
100 PRINT "SWORD" + "FISH"
110 PRINT "SWORD": "FISH"
120 PRINT "DAY", "NIGHT"
130 PRINT "3+3"
```

Table 1

SIGN	FUNCTION
+	ADDITION
-	SUBTRACTION
*	MULTIPLICATION
^	EXPONENTIATION (TO THE POWER OF)

Program 3

```
10 PRINT "
```

4) program is divided into lines, each with its own individual number. When the computer is asked to start the program working it begins at the line with the lowest number and then systematically follows through. Type in program one, remembering to hit RETURN after each line. The quotation marks (") can be obtained using the keys "shift" and "T". If you make any mistakes then you can use the INS/DEL key to erase any previous characters.

Nothing will actually happen yet — the computer has just stored up the program in its memory. You can check this by typing LIST followed by the RETURN key. This will display the program lines in numerical order regardless of the order they were typed in. When you are ready to get the program working type RUN, but don't forget that RETURN key. If you have any difficulties with the program not working check that it is absolutely correct. Any lines which are not right can be re-typed. When you get fed up press the RUN/STOP key.

Comments

Now let us see how the program was constructed. The lines are numbered 10 and 20 so that there are plenty of gaps in between to add extra commands. For example, we would add another line labelled 5 or 15, it doesn't matter how the lines are numbered, as long as the line numbers correspond to the order the program is to be worked.

Line 10 prints on display on the screen the letters within the quotation marks. You could change the word "HELLO" to anything else by re-typing the line. Try this and use "LIST" to check that the computer has noted your alteration. Adding a semicolon (;) after the final quotation mark will produce an interesting effect.

Line 20 tells the computer to go back to line 10 and begin again.

You can erase any line by typing the appropriate line number followed by the RETURN key. Try erasing line 20 in our original program.

If you want to get rid of an entire program use the command "NEW" followed by the RETURN key. This should always be used with care — once your program has been erased it cannot be retrieved. Always remember to use the "NEW" command before entering any program from this article to erase any previous program.

Try program two. Remember to use NEW, the RETURN key and RUN to get everything working properly.

Compare the results obtained to the program itself and you will see the different ways in which the print statement works. Take note of the different mathematical functions in table 1.

You have already seen how to move the cursor and change its colour. Now let us build these ideas into a program which will print the word "HELLO" in black 3 spaces down the screen and 9 spaces in. Start by typing program 3.

After the quotation mark press CTRL and L. You will see a little square appear

Program 1

```
10 LET T=0
```

Program 2

```
20 LET T=T+6
```

Program 3

```
15 PRINT T
25 PRINT T
```

Program 4

```
10 LET A$="HELLO"
20 PRINT#6 A$
30 GOTO20
```

Program 5

```
10 A$="HELLO"
```

Table 1

SYMBOL	MEANING
<	LESS THAN
>	GREATER THAN
=	EQUAL TO
<>	NOT EQUAL TO
>=	GREATER THAN OR EQUAL TO
<=	LESS THAN OR EQUAL TO

Program 3

```
10 T=0
20 PRINT "HELLO"
30 T=T+1
40 IF T>2THENSTOP
50 GOTO20
```

on the screen which is called a 'control character'. It tells the computer to change the colour within the program and not directly as we have done before. Follow this with 5 presses of the cursor down key, 5 presses of the cursor right key, the word 'HELLO' and finally a quotation mark. Hit RETURN and RUN the program.

Variables can be thought of as little boxes within your computer which can hold information. The box is given a name so it can be referred to later. For the moment you will be creating 2 types; firstly variables with names consisting of 1 letter, 2 letters or a letter and a number, for example A, TT, F1. Each of these 'boxes' can only hold one number. If we want to put the number 6 in a variable called T this is what we type into program 4.

Try this short program out. Now let's add 6 to the variable, as shown in program 5.

If...Then

You will notice that when the print command is used in conjunction with a variable no quotation marks are required. The way we have built up this short program also illustrates the importance of leaving plenty of gaps between the line numbers.

The second type of variable such as A\$, A&E, A% consists of letters or letters and numbers followed by a dollar sign. These can hold strings/groups of letters and numbers but the numbers cannot directly be used in mathematical calculations. Try program 7. You should be familiar with all the commands included.

Up till now we have been using the LET statement to put something into a variable, but it is not really necessary. Thus we could change line 10 in our last program to that in program 8.

Before we see another program using variables let's learn a little about IF... THEN statements. They can be used in conjunction with variables to set up conditions within programs in the form of 'IF something happens THEN do something else.' Refer to table 2.

Now let's try program 9. When it is run 'HELLO's will be printed on the screen. 'T' is the name given to the variable which means that it can only hold a number.

For...Next

Line 10 makes sure that T is set at 0 and each time HELLO is printed the number held in the box is increased by 1. Line 40 checks to see if T is greater than 4 and if it is it automatically stops the program. Otherwise it continues to line 30.

In the last program we were able to control the number of times an operation was completed. Although the program worked well there is a faster and shorter way of arriving at the same result. Try program 10 which employs a FOR...NEXT loop.

This time you only need 3 short lines. I have chosen the variable T again so that you can easily compare this program with our last one.

The computer begins at line 10, setting T at 1. HELLO is printed and the

Program 10

```
10 FOR T=1 TO 5
20 PRINT "HELLO"
30 NEXT T
```

Program 11

```
10 PRINT "HELLO"
20 FOR T=1 TO 1000: NEXT T
30 PRINT "GOODBYE"
```

Program 12

```
10 FOR T=1 TO 999: STEP 2
20 PRINT "HELLO"
30 NEXT T
```

Program 13

```
10 FOR X=18 TO 85: STEP -1
20 PRINT X
30 NEXT X
```

Program 14

```
10 FOR T=1 TO 10
20 FOR X=1 TO 5
30 PRINT "HELLO"
40 NEXT T
50 NEXT X
```

Program 15 - 15-20

```
10 FOR X=1 TO 15
20 FOR T=1 TO 10: STEP 2
30 FOR X=300: TO X
40 FOR X=300: TO T
50 NEXT T
60 NEXT X
70 FOR X=300: TO 0
80 FOR X=1 TO 10: STEP -1
90 FOR T=250 TO 100: STEP -1
100 FOR X=300: TO X
110 FOR X=300: TO T
120 NEXT T
130 NEXT X
140 FOR X=300: TO 0
150 FOR X=300: TO 0
```

4. NEXT statement sends the computer back to line 10. T is increased to 2 and the process begins again.

When T is 3 and the final HELLO has been printed the NEXT statement sends the computer back to line 10 where T becomes 4. As it is now out of its limits, the program jumps to the line after the NEXT statement or, if there are no more lines, finishes.

Loops

It is often useful to stop a program in the middle of running it for a short time, for example to give a user time to read some instructions. See program 11.

Line 20 crosses the delay. The program sticks here until T reaches 1000. You will also notice that there is more than one command on this line, each separated by a colon (:).

So far the variables in any of the FOR...NEXT loops have only increased by 1 each time. This can be altered as in program 12.

This time the variable increased by 22 each time and HELLO was printed 5 and not 20 times. It is also possible to have negative steps as in program 13.

At first sight program 14 might appear perfectly correct, but in fact the loops have been incorrectly 'nested'. The T loops was created first, so its NEXT statement should come last. Therefore lines 40 and 50 need to be exchanged. Once corrected the program will print the word HELLO 50 times. The X loop prints HELLO 5 times and the T loop repeats this a further 10 times.

The nesting of loops is a technique frequently required when making sound effects. Even if you don't yet know how to use your computer's sound facility try the appropriate program, 15(a) for the Vic-20 or 15(b) for the Commodore 64.

The INPUT command is used to obtain information in the form of letters or numbers from the program user. Try program 16.

Remarks

When a question mark appears answer the question and then press RETURN. The variable A\$ holds your name and T your age. You can then use this string variable information in later stages of your program.

REM statements do not affect the way in which programs work. They allow the programmer to add notes around the program to explain its workings, etc. For example, see program 17.

When typing in a program from a book or magazine the REM statements can be omitted so long as you're not removing lines which are referred to elsewhere in the program.

Now that you have worked your way through this article, let's end with a final program (18) which includes several of the principles you have learned about.

You should now have mastered many of the most essential principles of programming in Commodore Basic, and be ready to incorporate them in your own programs. ■

Program 10 — GEM 10

```
5 FORK=1T00
10 FORCS4200,15
20 FORCS4277,10
30 FORCS4278,8
50 FORU=15T00STEP-1
60 FORLP=100T0101
65 FORCS4278,20
67 FORCS4250,10
70 FORCS4275,10
68 FORCS4274,10
90 FORCS4279,24
100 FORCS4272,63
105 FORCS4276,8
110 NEXTLP
120 NEXTU
130 NEXTX
```

Program 11

```
5 PRINT"WHAT IS YOUR"
10 INPUT"NAME":PA$
20 PRINT"HELLO "PA$;"!!!"
30 INPUT"HOW OLD ARE YOU?":T
40 PRINT"NOW I KNOW THAT "PA$;" IS "T;"
  "YEARS OLD."
```

Program 12

```
10 REM HELLO PROGRAM
20 REM BY SARAH COTTON
30 PRINT"HELLO"REM PRINT WORD ON SCREEN
40 GOTO30:REM BEGIN AGAIN
```

Program 13

```
10 REM AVERAGES BY S. COTTON
20 REM THIS PROGRAM WAS LISTED ON THE 15
30 PRINTER-PLOTTER WHICH CANNOT HANDLE
40 REM THE NORMAL CONTROL CHARACTERS.
40 REM INSTEAD IT HAS ITS OWN CHARACTERS.
.
50 REM "L" =CLR+HOME AND SHIFT
60 REM "D" =CURSOR DOWN KEY
70 PRINT"L"-----AVERAGES-----
80 PRINT"Q, HOW MANY NUMBERS DO?"
90 PRINT"Q, YOU WANT TO ANALYSE."
100 INPUT"Q,":M
110 PRINT"Q, PLEASE INPUT THE"
120 PRINT"Q, NUMBERS ONE AFTER"
130 PRINT"Q, EACH OTHER."
140 FORK=1T01500:NEXTX
150 FORK=1T010:NEXTU
160 INPUT"Q,000000000000"NUMBER:IA
170 T=T+0
180 NEXTX
190 PRINT"Q,000000000000" AVERAGE="T/A
```




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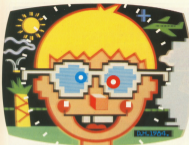


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Graphics in 3D

Adrian Warman presents a beginner's guide to 3D graphics on the 44 with Simon's Basic

ONE OF the most popular pastimes for the owner of a home system is to attempt to produce some really spectacular graphic displays. Unfortunately, it is very rare for even experienced programmers to achieve good results — certainly the sort of pictures featured in many games such as *Beach Head* or *Alice in Videoland* are notable for their rarity just as much as their quality.

All too often, attempts to produce graphics fail through lack of thought or preparation. The aim of this article is to provide a practical demonstration of how a simple 3-D shape can be manipulated, as well as explaining a little of the theory behind the program.

As soon as a programmer has decided to produce a picture of a given object, a whole variety of aspects must be considered. What is the object to be portrayed? What is the object expected to do? Under what conditions will the object perform these actions?

Alice in Videoland

The last of these questions may at first sight appear confusing. It refers to how much of the image will alter as time passes, and with what amount of detail. For example, the famous picture of Alice in the Garden from *Alice in Videoland* is extremely detailed, but it is completely static, serving mainly as a background for the game character and episodes moving across its surface. This means that more drawn, the picture will be unaffected. Conversely, the air battle scene from *Beach Head* is not static at all, and is expected to interact with the user (for example, aircraft fly overhead as the ships move). As a result, to make the picture 'mobile' and also achieve a reasonable response time, the amount of detail is reduced.

What this means in practical terms is that if you want a very fast response time, you cannot have a lot of detail. Conversely, if you want a lot of detail, the response time may become increasingly slow. This generally applies right the way up through to big mainframe computers, and not just for computer graphics. The reason that big computers seem to have the best of both worlds (big detail and speed), such as shown on commercial flight simulators is simply that they are very fast with vast memory stores, and often have extra facilities to do selected jobs (the so-called 'dedicated' machines).

The sprites on the Commodore 64 computer do provide an easy way to reduce small quantities of bit-map data at high speed. But, any manipulation of the physical data used in the sprite will either require a lot of time, or a large number of sprite patterns which differ from each other

only slightly (and hence better performance requires more speed and/or more memory — particularly the former). The conclusion is not to expect too much from the humble home sprite.

But, let us look at what can be achieved. The accompanying program is a very general routine which will draw a 3-D wire-frame (or a hidden line) representation of a cube through space as it rotates about an axis. An elementary knowledge of geometry is assumed, but so long as you understand the concepts of 'angle' and 'co-ordinates', you should be alright.

The first task is to describe the object to the computer. This is done by listing the co-ordinates in space of each of the eight corners of the cube. For the sake of convenience, the cube is assumed to have the origin in its corner.

However, it is not enough just to tell the computer where the points are, we must also provide information as to how they link up to each other. This is achieved fairly simply by listing the pairs of points which connect to each other.

You should now enter the accompanying program. Once you have got this running (conversion tools for other languages are provided) the theory should be easier to follow.

The program uses very few machine dependent features, and those which are used are taken from the Simons' BASIC simulation cartridge. Only three special commands are used, and they control elementary graphics routines. Referring to the accompanying information should help you to convert to other graphics packages or languages which support graphics — such as Pascal or COMAL. A brief description of the main sections of the program follows:

Lines	Purpose
1000	The main part of the program starts here. A subroutine will be made to load in the data for the cube, and to set up certain parameters to be used in the drawing routine.
1050-1080	The main loop of the program. The cube will be moved in space on your screen, so for each display the new position for the cube must be calculated, and the cube itself also drawn.
1090	For the POWER 3.2 cartridge the Commodore 64 is a high resolution display, with co-ordinates at 0/0, 63/0, 63/63, and 0/63/63 for corners right. The numbers represent respectively the information to make foreground pixels green and the background black.
1100	Exit the program. Some languages will automatically restore the user screen when the program ends, so the method of ending will prove useful the next time.
1120	The dimension statement sets up

arrays to hold the data describing the cube. PITCH holds the co-ordinates of each of the eight corners of the cube. X/Y/Z holds the data for each of the 12 edges of the cube.

1000-1010 Read in the corner co-ordinates.
1010-1020 Read in the edge data.

1030 The function will be used to produce the scaling effect. An eye will be better understood after reading the theory.

1040 As the cube moves, it will be rotated about one of its axes. The angle of rotation is set in this line, and it set here to 0.2 radians (about six degrees). This is the most important statement in the program. It is responsible for showing the line(X1, Y1, Z1) — (X2, Y2, Z2). Naturally, a 3-dimensional line cannot be truly represented on a 2-dimensional surface so the Y2 screen, and not in 'Z' as the effect, more obvious changes will appear smaller (in just the same way as on a television program).

The Simons' BASIC command DRAW X1, Y1, X2, Y2, I will draw a line in the current foreground colour from (X1, Y1) to (X2, Y2).

1050-1060 This routine will draw the cube. Each edge is drawn one at a time. For each edge, the user (X1, Y1, Z1) position and end (X2, Y2, Z2) position is found, prior to drawing the line.

1060-1080 This routine will rotate the cube around one of its axes. Note that it is the corners that are moved, not the edges. This is because the edges will connect the moved corners, but the corners are rotating through space.

1090-1100 The data giving the co-ordinates of each of the corners.

1110-1120 The data describing each edge. (X1, Y1, Z1) and (X2, Y2, Z2) indicates the corner 1 joins to corner 2.

1130-1140 The routine to exit the program. Once the drawing has finished, the border will change to dark grey, and the computer will wait for you to press the RETURN key.

1150 The command PAUSE simply restores the user screen.

1160 The command PAUSE simply restores the user screen.

3D theory

It is well known that television pictures only appear to be 3-dimensional, an effect achieved by making more distant objects appear smaller. The program performs a mathematical operation on a given co-ordinate to make it up or down in size depending on whether it is close to you or far away. Since we have to decide on an arbitrary size, we assume that the screen has X values going from -100 to 100 inclusive as you traverse from left to right, and Y values going from -100 to 100 inclusive as you descend from the top to the bottom of the screen.

The Z values are a little more complicated. The program assumes that when Z is -100 units, the object is right on the surface of your eye — this means the

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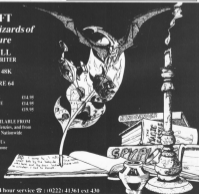
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4. object appears infinitely large because it is so close. As Z value of zero is values to mean the surface of the screen itself. Hence if you draw a rectangle with co-ordinates at (-100, -100, 0), (-100, 100, 0), (100, 100, 0) and (100, -100, 0) then it will probably fill the screen. Lastly, as the positive Z values become larger up 100, 200, 300, 1000 etc, the object will become smaller as it appears to recede from view. Drawing a cube at a distance of 1000 units will produce no more than a point.

Now, all we need to do is to devise a formula for converting co-ordinates depending on their distance. It is surprisingly easy to produce an approximate formula with sufficient accuracy for our purposes. Assuming that the size is dependent on the Z value, we find that a co-ordinate with true position (X, Y, Z) has an apparent on-screen position of:

$$XZ/1000/(1000-Z), YZ/1000/(1000-Z)$$

A close look at this formula shows several points. Firstly, we have converted a 3-dimensional point (X, Y, Z) into a 2-dimensional point (XZ, YZ) for the TV screen. Secondly, the conversion is achieved simply by multiplying by a factor dependent on Z, namely 100/(1000-Z). When Z is -200, the expression evaluates as 100/1 which means all points are magnified 100 times, because they are so close. When Z is zero, the expression gives 100/1000 = 1, and hence all points appear normal size. Finally,

as Z increases to (1000) + 200, the evaluation gives 100/1300 = 0.3, so all points are half size, and so on.

This simple expression is the one used to scale the co-ordinates in the program and, owing to its frequent use, is defined as a BASIC function in line 1206. The actual statement for drawing a 3-D line using 3-D is listed in line 1205. Note that the addition of + 100 or + 100 in the values is to contravene the origin (the normal screen is 100 x 100, and so the centre of the screen is at 100, 100).

We now have the ability to describe any line in 3-D. By making the two end points of the line to be the same, we can plot a single point. All we need care is remembering to draw. This is provided by the accompanying program as it draws a cube moving through space.

Two forms of motion are incorporated. The first is that the cube is moving away from you. This movement is controlled by line 1000 (which sets up the value LOC which ranges from -50 to 200, and is the Z value of the centre of the cube) and lines 1150 and 1160. As LOC increases, the cube is supposed to move away. This is done in the latter two lines by adding LOC to the normal value of the Z value of each corner.

The second form of motion is that the cube is rotating around one of its axes. Strictly, the corners of the cube are rotated around the axis. The program as listed will make the cube appear to rotate in a clock-

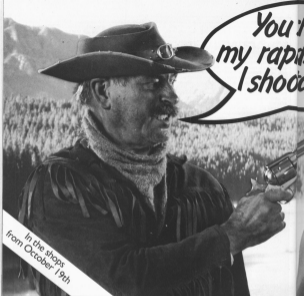
wise direction, with the actual change in angle given by line 1240. If you make ANG in this line negative, the cube will rotate in the opposite direction. Similarly, if ANG is set to zero, the cube will not rotate at all. You may like to observe how the cube appears if it rotates around other axes. Try replacing line 1400-1470 inclusive with either of the following alternatives:

```
1400 F=PI*50/C%
1401 P1=LOC+Z:INT(P1*50/C%)/50
1402 C=LOC+PI*50*50*ANG+0.5
1403 P2=LOC+Z:INT(P2*50*ANG)+
P1*50/C%*COS(ANG)+0.5
1404 F=PI*50/C%
1405 P1=LOC+Z:INT(P1*50/C%)/50
1406 C=LOC+PI*50*50*ANG+0.5
1407 P2=LOC+Z:INT(P2*50*ANG)+
P1*50/C%*COS(ANG)+0.5
```

Each of these alternatives will produce a different type of rotation. For extra effect, try combining two rotations (first performs one rotation, then performs the next, and so on . . .)

Hopefully, you should now have enough material to try a few experiments for yourself. Even if you do not understand all of the theory, you can see that 3-D effects can be achieved fairly quickly. If you try altering small sections of the program — concentrating on the lines mentioned in the text — you will see what effect they have on the display as it progresses. ■

```
1000 REM 3-D GRAPHICS ROUTINES.
1010 :
1020 REM BY A. MARRAS
1030 :
1040 SCREEN 1:20
1050 FOR LOC=-50 TO 200 STEP 20
1060 HPRINT 3-D
1070 SCREEN 1:20
1080 GOSUB 1440
1090 NEXT LOC
1100 GOTO 1740
1110 :
1120 REM INITIALISE
1130 DIM P1(0),P2(0),L(0),L(0),L(0),L(0)
1140 FOR S=1 TO 8
1150 READ P1(S),P2(S),L(0),L(0),L(0),L(0)
1160 NEXT S
1170 FOR S=1 TO 12
1180 READ L(0),L(0),L(0),L(0),L(0),L(0)
1190 NEXT S
1200 FOR C=0:200,0
1210 FOR S=0:200,0
1220 PRINT C;S;:
1230 DEF F(X)=100/(1000-X)
1240 @=0:1
1250 RETURN
1260 :
1270 REM LINE(S)
1280 LINE S;F(P1(S)+L(S)+LOC),F(P2(S)+L(S)+LOC),
S;F(P1(S)+L(S)+LOC),F(P2(S)+L(S)+LOC)+100,1
1290 RETURN
1300 :
1310 REM DRAW
1320 FOR S=1 TO 12
1330 S1=F(P1(S)+L(S)+LOC)
1340 S2=F(P2(S)+L(S)+LOC)
1350 S3=F(P1(S)+L(S)+LOC)+100
1360 S4=F(P2(S)+L(S)+LOC)+100
1370 S5=F(P1(S)+L(S)+LOC)
1380 S6=F(P2(S)+L(S)+LOC)
1390 GOSUB 1290
1400 NEXT S
1410 RETURN
1420 :
1430 REM ROTATE
1440 FOR S=1 TO 8
1450 W=PI*50/C%
1460 P1(S)=INT(P1(S)+L(S)+LOC*W*50/C%)/50
1470 P2(S)=INT(P2(S)+L(S)+LOC*W*50/C%)/50
1480 NEXT S
1490 NEXT C
1490 RETURN
1500 :
1510 DATA -50,-50,-50
1520 DATA 50,-50,-50
1530 DATA 50,50,-50
1540 DATA -50,50,-50
1550 DATA -50,-50,50
1560 DATA 50,-50,50
1570 DATA 50,50,50
1580 DATA -50,50,50
1590 :
1600 DATA 1,2
1610 DATA 2,3
1620 DATA 3,4
1630 DATA 4,1
1640 DATA 1,2
1650 DATA 2,6
1660 DATA 3,7
1670 DATA 4,8
1680 DATA 5,6
1690 DATA 6,7
1700 DATA 7,8
1710 DATA 8,2
1720 :
1730 REM END
1740 FOR S=200,11
1750 GOTO 64
1760 IF S=1:GOTO(15): THEN GOTO 1750
1770 FOR C=0:200,0
1780 NEXT
1790 END
```



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I am the music man, I come from down your way

David Fox takes a trip down melody lane with a review of *Musical*

HAVING mentioned *Musical* in previous articles on Commodore 64 music, it seems appropriate to take a closer look now, since UK distribution seems well established and additions to the original range are on the way.

The 64's powerful SID (Sound Interface Device) chip gives it the capability of making music comparable to many dedicated music synthesizers, and since there are three sound channels you can also play chords. The 64's large memory also means that it has the capability to store huge amounts of note information as DATA statements.

The big problem is in accessing all this power through Basic; since nine separate PROMs are needed to fully set a sound register, it's a formidable task to get more a heap out of the 64. It's much wiser to forget Basic and go for one of the many sound synthesis packages now available, of which the most powerful is *Musical*.

Musical is disk-based only, and is intended to be an open-ended suite of programs which can be revised, updated and expanded by future packages. Most excitingly, there are also plans to incorporate hardware and interface dedicated musical instruments.

Musical comes from Waveform of

California, and so far consists of three main programs plus two "templates", the function of which will become clear.

Musical 1, Synthesizer and Sequencer, costs \$40. On loading you are presented with a screen display showing all the available sound parameters. Using a system of bar graphs and keys, all the parameters — waveform, ADPR, frequency, filtering, and so on — can be individually controlled for the three voices.

Synchronised score

On the right of the display is a colourful grid with moving squares which synchronise with the score currently playing.

On loading there are actually 32 scores present as preset files. These range from rock to classical, Latin American, novelty and so on. Scores are selected from the keyboard, as are the 32 "sound sets" — combinations of different voice settings. In other words there are 1024 combinations of score and sound available on loading, which can be altered as you wish, cut down to basic form for use as backing music, or erased and replaced entirely.

The template disks mentioned earlier contain more of these preset files, the first selections being Rock and Latin American.

Needless to say the American idea of Rock and Latin American is pretty laughable, but at least the demos are a good basis to work on.

Musical 1 has six major abilities, which we'll look at in turn. The first is sound synthesis, which is carried out straightforwardly with keys used to toggle switches or increments.

Secondly, composition is carried out on the Score Screen, in which an enlarged version of the multicoloured box on the main screen represents the note positions for each of the three voices throughout the composition. Scores are written using the cursor to place blocks on the grid, specifying octave and pitch for each one and adjusting tempo appropriately.

The third function is playing from the keyboard. It's impossible to overcome the inherent difficulties in playing in this manner, but the addition of a mechanical music keyboard is a future possibility. The *Musical* 3 package, Keyboard Make (which can only be used in conjunction with *Musical* 1) can be used to define any keyboard parameters, and to set unconventional scales — great for Stravinsky fans.

The fourth function of the *Musical* 1 package is to select preset scores or load templates. There is previous title information in the main screen on how to go about this, and I would hope that this lack would be corrected before *Musical* hits the shops.

**"There are
1024 com-
binations"**

The fifth function is the storage of sound/wave sets to a blank disk, which means of course that your symphony can be recalled for performance or modification at any time.

The last function, and possibly the most exciting one, is the ability to call in other programs to work with *Musical* 1.

Again there is an incredible lack of detail in the manuals with which I was provided.



The MusiCalc 2 package, for instance, has the ability to print out musical scores (given a suitable printer), and allows MusiCalc to be synchronized with drum machines such as the ubiquitous Roland TR-606 Drumatic. But how? There are also hints on the effects units such as digital delays can be used in. MusiCalc 2 costs £31, as does MusiCalc 1.

The templates are £15 each, and the next one in the series is The Beat File, a set of drum rhythms ranging from rock to swing.

So MusiCalc is an incredibly powerful system, totally appreciated and capable of allowing composition, music writing and sound synthesis with no necessity for

musical training or expensive dedicated equipment.

The main problems at the moment seem to be with the manuals, which are very full and detailed in most places but seem to miss out on some areas altogether. Let's hope the situation is rectified.

Limitless future

The future of MusiCalc is virtually limitless. Although the two American keyboards on show at the PFF's International Commodore Show in June are unlikely to be imported due to prohibitive shipping costs, MusiCalc UK hopes to produce a keyboard for around £80.

There's no indication yet whether this will be a full mechanical type or a touch-type.

Other projects include a cartridge version of MusiCalc 1, more templates, and, most importantly, a MIDI interface.

As explained in previous articles, MIDI is a standard which has been adopted by all the major synthesizer manufacturers, allowing synths, drum machines and sequencers to exchange music and patch information. There are already interfaces and software available from SIEL, Sequential Circuits and Reason, allowing the 64 to control MIDI-driven equipment, and the prospects for a MIDI version of MusiCalc are very exciting. Plans are also afoot to allow two 64's to be connected together, presumably controlled by a mechanical keyboard or MIDI synth, allowing six-note computer polyphony.

At the moment MusiCalc is available mail order from MusiCalc UK, The Paradox Group, The Metropolitan, Lathford Road, London N11, 01-241 2448. Brief cutlets are being developed, although MusiCalc UK feels that a cheap environment is perhaps not the best place to get the feel of the system's possibilities. Admittedly the MusiCalc suite is so powerful that it would take hours to get a full dose — but even the briefest taste will I think win you over. *Electronic Soundmaster & Computer Music*, a monthly magazine available from all good newsagents, will be carrying an audio tape including a MusiCalc demo in a forthcoming issue. Watch out for it — MusiCalc is well worth hearing. ■



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ADSR's filters, waveforms and resonance — David Fox discovers how easy it is to bash out a tune with Commodore's budget performance package, the remarkable Music Maker

RECOGNIZING AT a remarkably low cost that many 64 users want to do more with their machines than squash aliens, Commodore has, in conjunction with the UK's biggest music publishers, Music Sales, come up with the **Music Maker** system.

It allows you to use your micro as a musical instrument, without the disadvantages of having to note information through the QWERTY keyboard, as you must with most of the available music composition software packages (see *Commodore Horizons* May issue). At the same time you don't have to spend money on a full-size mechanical music keyboard, such as the 109 Krite I or the 1125 Acoustaphone Microcomputer 64.

The **Music Maker** is cheap, easy to use and fun, and should sell in its thousands, especially if it gets into the shops in large quantities in time for Christmas. Basically, it uses the facilities of the 64's sound interface Device — the SID chip — to turn the micro into a musical instrument, comparable to one of the cheaper Casio home keyboards.

Keyboard

The main feature of the **Music Maker** system is the clip-on mechanical keyboard, which sits over the top rows of the 64 and mechanically depresses the QWERTY keys when pressed. Also included in the package is a set of stickers, which inexperienced musicians can use to aid key identification, a music book, one of the 8FX series from Music Sales, and software on disk or tape.

The software, developed by Richard Watts of Milton Keynes Music, gives the 64 many of the capabilities of the immensely popular Casio VL-Tone. In the main menu, the function keys can be used to control rhythm select, which gives a choice of four backing rhythm combinations; tempo; bass line poly play, which gives three-note chords; and voice modify, which allows most of the facilities of the SID chip to be used to define new sounds.

There is a useful performance feature, common on real synthesizers, by which the pitch of the note played can be bent by pressing on the spacebar. Unfortunately it doesn't seem to work in poly mode, as

also downwards pitched.

In Voice Modify mode, the four envelope parameters can be changed with single use of the function keys. Attack, Decay, Sustain and Release — the magic mantras describing the "sound shape" of a voice, the way it falls in, holds at a certain level, then falls out again — can be set from 0 to 15. Waveform waveform, triangle, pulse or noise can then be set — these control the sound quality, whether it's thin, dull, low, or in the case of noise, merely a wide hissing sound.

Pulse width can then be selected in the case of the pulse waveforms, which gives further control over the sound quality. Filtering — the selection of low or high frequencies to be stressed or removed from the sound — is then selected, as is resonance, the "feedback" or power of the filter.

Popular

Having set your desired sound you can now enter a tune with one finger, paying no attention to the timing of the notes. The 8FX music books give many examples of popular tunes, but definitions of "popular" are subjective. Elvis Presley's *Wooden Heart* may be some people's idea of music, but give me Klaus Scheller's *Smooth Entries* any time.

Having entered the notes you can enter

the timing by tapping any key in the correct rhythm. The computer time can then be played back in perfect timing.

Voices or tunes can be saved to tape or disk and reread at any time, and there are three demonstration tunes included in the software: *Georgia*, *Swan Lake*, and, predictably, *Wise I to 64*.

It's very nice to see that there's a routing facility included in the software; you can tune the 64 to a piano, guitar or any synthesizer. The system could then be used as a primitive sequencer or drum machine, or as a lead or polyrhythm at a pitch.

The handbook gives some useful suggestions for sound settings, and incorporates guidance on inputting your 64's sound to a hi-fi system, an excellent idea if you mean to use the system at all seriously.

Though the **Music Maker** system is fun in itself, there are a couple of reservations. The (optional) keyboard seems a little flimsy, though professional models will apparently be more robust. There's also no provision for modulation of sounds, though a future software package, Pres-Synth, should make use of the capabilities of the SID chip available including modulation, sync, ringmod and so on.

Hardware

Other packages planned include a composition program which will enable musical notes to be placed on a graphic representation of a music staff. This package should also allow compositions to be printed out, in the same way that **Waveform's** *MusicCalc 2* package does.

In fact the **Music Maker** system should eventually resemble **Waveform's** more expensive *MusicCalc* suite of programs. With the initial **Music Maker** package costing only £29.95, it seems certain that many budding computer musicians will find this the ideal introduction to the subject — and with something like of further Commodore music hardware, perhaps even a MIDI interface which will allow professional-standard synthesizers to be connected to the 64. Commodore holds out the promise of a happy future for musical 64 owners. ■



Music Maker — good, fun, and more to come



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This plugin cartridge will enable you to write assembler source code as easily as Basic. Written by Andrew Trant, it contains a full screen editor, a three pass assembler and can be used with tape or disk. A free Zoom machine code monitor (worth £11.50) is included in the package.

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Basicals

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Music Master

If you have ever wanted to use your 64 as an electronic music synthesizer, this is the program for you. Drums, wave forms and filter parameters can be defined, while any combination of voices can be played piano fashion. A Background Music Player contains 24 pre-programmed rhythms and patterns. Music Master, also enables you to create a variety of special effects including volume and panning.
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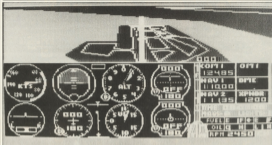
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Flight Simulator II takes to the air

*That daring young man in his flying machine Pete Gerrard finds
that taking off is a great deal easier than landing*

THERE ARE flight simulators, and there are flight simulators, and so far most of the material that has been produced has involved little more than pressing a few buttons, hearing a few engine noises and seeing a couple of dial lights on the screen. A real pilot would be very disappointed by the quality of most flight simulator software currently available.

Apart, that is, from this one. **Flight Simulator II** is a programming tour de force, and everything about the package smacks of a loving care and attention to detail. Included in the package is one diskette, one program manual, and one further manual concerning itself with flight physics and aircraft control so it applies both to this program and to flight generally. It is only available on disk, due to the complexity of the suite of programs on it (aircraft programs and on-screen displays are continually called up from disk, and the random access that this provides couldn't hope to be achieved using tape). You can play, if that's the right word for a program of this standard, using a combination of keyboard and one or two joysticks, although you can get by using the keyboard alone if you wish.

Further documentation supplied is impressive. There is a flight reference card, telling you what all the main controls do, along with four maps of various airport areas. These cover the Chicago, Seattle, Los Angeles, and New York and Boston areas, listing all the major airports in the vicinity. Really, the amount of detail that has gone into putting this whole package together is highly commendable.

The only thing that was found to be at fault in a first encounter was an accompanying note, detailing some of the features mentioned in the comprehensive manual that do not, in fact, exist. Since everything else is covered down to the last detail, it seems a shame that such a factor as the effect of wind turbulence has been omitted. However, this is but a minor criticism.

OH the ground

To get off the ground and get the program running requires a good few minutes, during which time you see some mighty strange displays on screen as various high resolution displays are called up and discarded in favour of others. Throughout the game, the border

continually changes colour whenever any new files are called up: a nice touch, so let you know that the computer's still doing something.

The plane that you are about to pilot is a Piper PA-28-181 Archer II, which is a single engine plane, top speed of around 120 miles per hour, with non-extendable gear and equipped with a good set of controls. Apparently, this particular plane was chosen because it has a good performance, but is relatively easy to fly.

Once the initial few files have loaded, you are asked whether you are using a colour or black and white monitor (colour displays are tempered according to which is in operation), and then whether you wish to go into three flight modes or test flight. Either way you are into the program proper, and you start to actually do a few things with the plane.

You start off at Meigs field airport in Chicago, a small airport surrounded by Lake Michigan. The on-screen display is basically split up into two sections, the bottom half displaying the control panel, while the top half is reserved for a solid, colour (if the appropriate option is chosen) three dimensional display of what you're

coming out of the front of the craft. This display can be altered to give you a view 90 degrees to the left or right, and also a view of what's going on behind you.

Also, at this point in the game before you actually get off the ground, many other parameters and options can be chosen and selected, by entering what is referred to as the editor. Here, such factors as environment, wind speed, slowing system, difficulty of flight (whether you have a tolerant plane, or a more realistic one), season, and so on, can all be readily altered.

There is a further (very large) subprogram within the main set, which turns the program from being a flight simulator into a World War I fighting game, but more of that later. For now, let's get off the ground.

For once, you really do get the feeling that you are actually sitting in a plane on a runway, taxiing towards takeoff. As the throttle is opened up and you enter the device a little, the sound that you hear changes accordingly, the view from the front of the aircraft gradually changes also, and the control panel in front of you flickers into life.

After a few seconds, the magical moment arrives when you become airborne, and you rapidly realize that you haven't read the manual properly and don't know what on earth you're doing. Over in the air, the control panel shows airspeed, altitude, artificial horizon, slip indicator and turn co-ordinator.

Altering the rudder, ailerons, elevators and flap soon produces a calamity, and

with a self-satisfied smile the machine prints out the simple word "crash!" to indicate that you've had it. No problems here, unlike real life, as you simply start all again.

After a few more experiments which usually result in similar disasters, you slowly begin to get the hang of the thing, and attempt something a bit more serious: a flight to another airport. Not being too adventurous at first, I selected nearby Stroudham County, which seemed like a fairly straight forward flight. Before take-off, you are well advised to consult the map for information on the place you're going to try and get to, since this gives you a wealth of useful information about it, including (of course) where it is in relation to you, in terms of co-ordinates and altitude.

Unsuccessful flights

After a few unsuccessful flights like this, as landing is about the most difficult part of flying (well, landing successfully is either in real life or using such a realistic simulator as this, you can get more daring and attempt longer flights. The program, after all, is equipped to cope with the whole world, and although you've only got two fuel tanks on board you can obviously land and re-fuel en route to your destination. Landing at some of the more famous airports produces some startling three dimensional displays (the Statue of Liberty), and throughout I was just so impressed, and so convinced, about the whole thing.

The World War I fighting section mentioned earlier is probably best attempted after a good few hours flying.

because a novice at the controls is not going to stand much chance in open warfare. Here we have the familiar three dimensional view out of the front window, but one or two things have changed. Your radar will now show enemy planes approaching, and give some indication of their relative position and altitude. The plane is now equipped with machine guns, and the sights in the centre of the visual display reveal what you're aiming at at the time. In my case, usually a munitions or two, but I did manage one or two enemy.

Your mission here is to destroy the enemy, and ransack their bases. On one side of a river lies the enemy, on the other side you have your own base, and it's a good idea to have a scout before declaring open warfare, as this gives you the chance of finding out where everything is.

There is so much that one could say about a lot of programs as good as this that it would take an entire magazine to do justice to it. Professional pilots have said that they reckon it to be about the best simulator they've ever seen, and although I've never flown a plane in my life (and never will after the disasters encountered while trying to get the hang of this), I would have to agree. The review copy was supplied by the 44 Supplies Company of PO Box 19, Whitstable, Kent, which markets Flight Simulator II at £15.

Everything that a pilot would expect to find is in here somewhere, and anybody who has been disillusioned about flight simulators in the past should buy this. If you want something different, and don't mind spending a two week holiday flying planes in the luxury of your home room, then buy it. It's brilliant. ■



Hideous Bill is back — in Steve Lee's RATWHACK



VIRGIN GAMES has been around for more than a year now, and has matured from a fresh, Miami-bias sort of an affair into a company with a big reputation and a great line-up of games.

Virgin's star programmer Steve Lee has written *Hideous Bill* in *Ratwhack* specially for Commodore Horizons. Though it's ages since he's written in Basic, he backed this one out in a few hours — "You could enhance it by adding more spins to animate *Hideous Bill* and the rats. Apart from that the game has most of the elements of a commercial game: sound effects, skill levels and progressively more

difficult stages."

You must guide *Hideous Bill* through the maze of deadly scuttling rat whoppers, to stamp on the rats which scurry from one direction to another. The game requires a joystick in port one, but the Moon Man routine at 4800-4870 could be changed to read the keyboard.

Variables include X,Y, rat directions; T, test for dead rat; CM, pistol counter; DN, direction of pistol movement; SC, score; and LV, lives.

Read this issue's profile of Steve for some background on *Hideous Bill* and Steve's other programs for Virgin. ■

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4020 IFX=0THENY=1231:GOTO4040
4030 IFX=1THENY=1291:GOTO4040
4040 IFX=2THENY=1311:GOTO4040
4050 IFX=3THENY=1451:GOTO4040
4060 IFX=4THENY=1791
4070 X=INT (2*RND*50)
4080 Z=INT (RND*50)+70
4090 PEEK(X,Y,Z)
4099 RETURN
4100 REM RESET GAME
4110 PRINT" *****          PRESS FIRE TO PLAY "
4120 X=PEEK (50321):IF (XAND16) THEN4130
4130 SC=0:LV=0
4140 GOSUB4300:GOSUB4700:GOSUB4600:GOSUB4270
4199 RETURN
4200 REM CHECK FOR NEW/BAD COLL" N
4210 X=PEEK (50379)
4220 IF (XAND16) =0THEN4270

```



Continued on page 34

```

4222 POKES4296, 32: POKES4296, 32
4223 POKK=17020
4224 POKES4297, 3: NEXT: POKES4297, 8
4225 IF PEEK(53259) < 60 THEN 4296
4226 POKES3257, 60: GOTO4266
4227 POKES3257, 320
4228 LU=LV-1: IF LU < 0 THEN 4070
4229 PRINT " ***** "
4230 GAPPBK(53279)
4231 RETURN
4232 REM SET UP SCREEN
4233 PRINT "  "
4234 CH=0: DH=0
4235 PRINT "    " : POK=4070
4236 PRINT "      "
4237 NEXT
4238 PRINT "*****+SCORE*****"
4239 PRINT "4 "
4240 POK=12870: G24757EFG
4241 Y=INT(360ND(8)) + 70
4242 POK=INT(360ND(8)) + 3, Y: NEXT
4243 POK=12870: G24757EFG
4244 Y=INT(360ND(8)) + 70
4245 POK=INT(360ND(8)) + 3, Y: NEXT
4246 POK=12870: G24757EFG
4247 Y=INT(360ND(8)) + 70
4248 POK=INT(360ND(8)) + 3, Y: NEXT
4249 RETURN
4250 REM MOVE OBSTACLES
4251 IF D=0 THEN 4430
4252 CH=CH-1: IF CH=0 THEN DH=0
4253 GOTO4460
4254 CH=CH+1: IF CH=7 THEN DH=1
4255 POKES3276, (PEEK(53276) AND 248) OR CH
4256 RETURN
4257 REM CHECK HAWKAT COLLISIONS
4258 GAPPBK(53276)
4259 IF (X AND 48) < 16 THEN 4490
4260 T=1: GOSUB4610
4261 T=0
4262 GAPPBK(53276)
4263 SC=SC+10
4264 PRINT " ***** " : SC
4265 GOSUB4600
4266 RETURN
4267 REM MOVE BWT
4268 POKES4276, 4+1: POKES4276, 65
4269 IF D=1 THEN 4460
4270 IF PEEK(53264) AND 32: THEN 4440
4271 IF PEEK(53258) < 25: THEN POKES3276, 8: POKES3264, 44
4272 POKES3276, PEEK(53258) + 1: GOTO4600
4273 IF PEEK(53256) < 5 THEN 4070
4274 GOTO4700
4275 IF PEEK(53264) AND 32: THEN 4470
4276 IF PEEK(53276) < 40 THEN 4700
4277 IF PEEK(53256) < 4 THEN POKES3256, 355: POKES3264, 32
4278 POKES3276, PEEK(53256) + 4
4279 IF T=1 THEN 4460

```



```

4777 RETURN
4780 REM START MEM BAT
4781 IFFEEK(53257) < 142THENPOKE53259, 255:GOTO4739
4782 POKE53259, 50
4783 IF (XAND1) > 5THENX=X+POKE53259, 30:POKE53264, 12:POKE2945, 252:GOTO4799
4784 X=X+1:POKE53259, 50:POKE53264, 44:POKE2945, 252
4787 RETURN
4800 REM MOVE RAM FROM 1/5 PORT 1
4801 FOR Y=2501
4802 X=PEEK(54321)
4803 IFFEEK(53256) > 251THENX=XOR8
4804 IFFEEK(53256) > 192THENX=XOR4
4805 IFFEEK(53257) > 154THENX=XOR1
4806 IFFEEK(53257) > 214THENX=XOR2
4810 IF (XAND5) THENX=X+20
4820 POKE53259, PEEK(53256)+4
4825 IF (XAND4) THENX=X+30
4830 POKE53259, PEEK(53256)+4
4835 IF (XAND2) THENX=X+45
4840 POKE53257, PEEK(53257)+4
4845 IF (XAND1) THENX=X+60
4850 POKE53257, PEEK(53257)+4
4860 NEXT Y
4870 IF (XAND15) = 15THENX=888
4880 POKE4253, 32:POKE84260, 33
4899 RETURN
4900 REM GET SPRITE DATA
4910 FOR X=0 TO 255
4920 READ A:POKE16120+X, A:INEXT X
4930 REM SET UP VIDEO CHIP
4940 FOR X=0 TO 64
4950 READ A:IF A=255THENX=X+60
4953 POKE53246+X, A
4955 POKE53246+X, A
4960 NEXT X
4970 REM SPRITE POINTERS
4973 POKE2948, 254:POKE2941, 254:POKE2942, 254:POKE2943, 254
4976 POKE2944, 255:POKE2945, 255
4980 REM SOUND DATA
4990 FOR X=0 TO 254:READ A:POKE84272+X, A:INEXT X
4995 RETURN
5000 REM RAT RIGHT DATA
5008 DATA 0,0,0,0,0,0,0,0
5010 DATA 0,0,0,0,0,0,0,0
5020 DATA 0,0,0,0,0,0,0,0
5030 DATA 120,0,120,120,120,120,70,255
5040 DATA 224,17,255,174,17,255,240,13
5050 DATA 190,253,0,190,24,0,99,0
5060 DATA0,0,0,0,0,0,0,0
5070 DATA0,0,0,0,0,0,0,0
5080 REM RAT LEFT DATA
5100 DATA0,0,0,0,0,0,0,0
5110 DATA0,0,0,0,0,0,0,0
5120 DATA0,0,0,0,0,0,0,0
5130 DATA1,0,1,1,150,1,7,190
5140 DATA0,13,255,240,31,255,252,03
5150 DATA120,174,24,99,74,0,190,0
5160 DATA0,0,0,0,0,0,0,0
5170 DATA0,0,0,0,0,0,0,0
5190 REM BIR DATA
5200 DATA0,0,0,0,0,0,0,0
5210 DATA0,0,0,0,31,240,0,99

```



Continued on page 76

9220 DATA140,0,194,70,0,204,100,0
 9230 DATA224,14,0,191,200,0,222,122
 9240 DATA0,231,100,0,219,210,0,219
 9250 DATA310,0,219,210,0,219,210,0
 9260 DATA219,210,0,219,210,0,219,210
 9270 DATA0,122,220,0,31,240,0,0
 9280 RUN MAIN DATA
 9300 DATA0,04,0,0,04,0,1,00
 9310 DATA0,0,104,0,3,200,0,0
 9320 DATA252,0,12,20,0,4,00,0
 9330 DATA0,00,0,1,00,04,0,20
 9340 DATA04,0,20,192,0,00,0,0
 9350 DATA00,0,3,100,0,2,100,0
 9360 DATA0,0,0,3,0,0,0,0
 9370 DATA0,0,12,0,0,20,0,0
 9400 RUN VIDEO CHIP DATA
 9410 DATA00,09,20,227,09,09,09,227
 9420 DATA100,220,24,50,0,0,0,0
 9430 DATA12,200,200,200,200,03,200,200
 9440 DATA 200,200,200,0,10,200,0,0
 9450 DATA 0,11,0,0,0,14,7,10
 9460 DATA 10,10,10,0,10,0,0,12
 9500 RUN SOUND CHIP DATA
 9510 DATA0,72,0,0,0,33,0
 9520 DATA0,0,0,0,32,35,0
 9530 DATA0,1,0,0,32,112,240
 9540 DATA0,0,0,10



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Then fill in the tie-breaker in an apt, original manner in fifteen words or less, and post your entry to the competition address. If you do not wish to cut your copy of Commodore Horizons, photocopy or use plain paper copies will be accepted.

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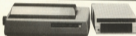
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4 The Y, or vertical, co-ordinates are slightly more complex. Starting from the base of the (bottom end of the axis, which is 180 pixels down the screen, the value of the DATA item is first divided by UNIT. Thus if the DATA item were 1,000,000 and the user had specified that the vertical axis was to be divided into units of 100,000, (UNIT = 100,000), then the result would be 1,000,000/100,000 or 10 units. Having arrived at the number of units, this is then multiplied by the length in pixels of the vertical axis (181). The figure arrived at is subtracted from 180 since the screen is numbered from zero at the top.

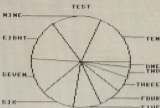
Line 1000: Each time a single line is drawn on the graph, its end point becomes the start point for the next line. If T% contains 100, however, the following line will terminate the execution of the loop.

Testing

RUN the finished program and you should see a smooth, bell shaped curve drawn. When drawing is finished, press any key and you should see the DATA module listed onto the screen so that you can alter them at will.

One very useful way of presenting small amounts of data is the pie chart technique, where a circle is broken up into segments representing the proportion of a total handed over to the different parts which make it up. In the program which follows we shall draw on what we have already learned about the mathematics of circles

Figure 2.1: Pie Chart



(Note the relative area of the lettering in graphics mode two)

and the flexible use of DATA statements in the last program.

As with the previous high resolution graph, the figures on which the present graph will be based are contained in DATA statements, this time in module 2.2.1. Note, however, that in the program as listed, the two arrays which will be used to hold the name of each item and its value are not

dimensioned, so you are limited to 10 items.

Frankly, a pie chart with more than 10 items is of little value, because it becomes too crowded to easily take in the information. Even so, you can if you wish include a dimensioning statement at the beginning of the program. If you do include such a statement and increase the number of items, you may find that you have to drop some of the module headings, since the program runs right up against the limits of memory.

Module 2.2.2 processes the data for the chart. The information contained in the DATA module is read into the variables NAME% and ITEMS, and the arrays NAME% and A.

Commentary

Lines 5000-5100: The value of the items to be charted are first added together to discover the total that the circle will represent. The DATA pointer is then RESTORED to the beginning of the quantity figures and each quantity is translated into a second figure which, when divided into 180, would give the same result as the original quantity divided into the total. For instance, if the total was 180, and the quantity for one item was 25, this would be translated into 90, or 20% of 180. These new figures will later be used to determine how large a chunk of the pie chart will be given to each item.

Testing

Enter the following lines from what will eventually be the control module, and then RUN the program:

```
run control.mcr
run ch02a
```

If all is well, then nothing should happen visibly — only if there is an error of some kind will you see anything. If you wish, however, you can print out the contents of the variables and arrays named in ▶

Module 2.2.1: Lines 4000-4800

```
4000 REM*****
4010 REM DATA FOR CHART
4020 REM*****
4030 DATA TITLE,TEST
4040 DATA NUMBER OF ITEMS,10
4050 DATA NAMES,ONE,TWO,THREE,FOUR,FIVE,SIX,S
EVEN,EIGHT,NINE,TEN
4060 DATA
4070 DATA QUANTITIES,1,2,3,4,5,6,7,8,9,10
4080 DATA
```

Module 2.2.2: Lines 5000-5110

```
5000 REM*****
5010 REM PROCESS DATA
5020 REM*****
5030 RESTORE 4000
5040 READ T%,NAMES
5050 READ T%,ITEMS
5060 READ T% : FOR I=0 TO ITEMS-1 : READ NAME%
NEXT I
5070 RESTORE 4070
5080 SUM=0 : READ T% : FOR I=0 TO ITEMS-1 :
READ T% : SUM=SUM+T% : NEXT T
5090 RESTORE 4070
5100 READ T% : FOR I=0 TO ITEMS-2 : READ T% :
A(I+1)=(T%/SUM)*360+A(I) : NEXT I
5110 RETURN
```

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4 the module just to reassure yourself.

Module 2.1.3 sets up the graphics mode and associated colours, and draws an 80*80 circle in the centre of the screen, together with the name for the chart.

Commentary

Line 200: The graphics mode we are going to use is multi-colour mode, which will allow us to have three different colours (plus the background) on the screen at the same time. The advantage to this is that it makes the chart easier to read. But the more colours it is possible to have on the screen at any one time, the more complicated it is for the CIB to record the colour of each individual pixel, and the more memory is needed.

Since the graphics screen already uses up enough of the memory, when we go into multi-colour mode the operating system does a trade-off between colour and detail. Once it is made three the smallest unit we shall be able to actually do anything with will be one pixel down by two pixels across. The screen, so far as the CIB is concerned, will no longer be 100 pixels across but 100, thus saving memory which can be devoted to remembering the greater range of colours.

From now on, therefore, whenever you look at the X co-ordinates (across the screen) of anything in this program, remember that you need to double it before it is comparable with the same co-ordinates in previous high resolution programs in the book which use normal high resolution.

Line 204: The line expression in the CHAR statement simply means that no matter how long the title given to the chart, it should always look as if it has been placed roughly in the middle of the top line.

Module 2.1.4: Lines 2000-3200

```
2000 REM*****
2010 REM INSERT SEGMENTS
2020 REM*****
2030 FOR I=0 TO ITEMS-1
2040 R=PI(I)/180#*E
2050 DRAW ,80,100 TO 80+40#COS(R),100+80#SIN(R)
2060 NEXT I
2070 FOR I=0 TO ITEMS-1
2080 R=(R(I)+4)/180#*E
2090 CC=I-3*INT(I/3)+1 : IF I=ITEMS-1 THEN C=C#
2100 PRINT CC,80+32#COS(R),100+72#SIN(R) , I
2110 TR=(R(I)+R(I+1)+ITEMS*(I=ITEMS))/2
2120 IF R(I+1)<R(I) THEN TR=TR+180
2130 R=TR/180#*E
2140 TX=80+40#COS(R)
2150 TY=100+80#SIN(R)
2160 DN=ABS<180#(TC-CC)>
2170 DRAW ,TX,TY TO DN,TY
2180 CHAR 1,DN/4+(LEN(CHR(I))-1)*#(DN=100) ,TY/8,CHR(I)
2190 NEXT I
2200 RETURN
```

Module 2.1.5: Lines 2000-2070

```
2000 REM*****
2010 REM DRAW FRAMEWORK
2020 REM*****
2030 GRAPHIC 3,1
2040 COLOR 0,1 : COLOR 1,2 : COLOR 2,4,4 :
COLOR 3,6,4
2050 CHR ,20-LEN(CHR(I))/2,0,CHR#
2060 CIRCLE ,80,100,40,00
2070 RETURN
```

Line 2000: An illustration of the polar mode starts about dimensions in multi-colour mode. To make sense of the position and dimensions of this circle, multiply the first and third parameters by two.

Testing

Add the following line and then RUN the program:
see colour see
see colour see
see colour see

The result should be nothing more exciting than the title given to the chart and a white circle. From any key except RUN/STOP to get back to the normal screen.

Module 2.1.4 draws in the segments (two which the chart will be divided, colours them and attaches the labels specified in the DATA module. In order to understand what is going on, you will need to be able to remember the simple mathematics of a circle.

Commentary

Lines 2030-2060: A series of lines are drawn from the centre of the circle to the

circumference, dividing the circle up into the segments for the chart. The figures used are those calculated in Module 2.1.1.

Lines 2060-2180: The angles at which the segments start are calculated again, but four degrees are added to each to clear the line drawn by the previous loop. A position is then calculated on the basis of this angle which is just inside the circumference of the circle. The PAINT command is then used to colour the wedge shaped segment in which the current point falls.

Line 2090 produces a circle of the three foreground colours specified in Module 2.1.1, except for the last segment, which is left as background colour. This is because it means that the final segment cannot be the same colour as the first. Since they are next to each other this would make the chart harder to read.

Lines 2110-2130: These two lines calculate an angle half way between the start and finish point of the current segment. It is possible that in moving from the start point to the finish point we will cross the 360.0 boundary on the circle, producing a somewhat figure-eight adding 180 rectifies this.

Lines 2140-2150: The figures needed for defining a point in relation to the radius. The reason that the SIN and COS values are stored in the variables TX and TY on this occasion is that they are going to be used more than once in a line and there would not be room to spell them out in full.

Line 2160: You will recognise the use of a logical condition here. Its effect is to make DN either zero or 179 according to whether the point defined by TX and TY is to the left or the right of the centre of the circle.

Lines 2170-2180: A line is drawn from the circumference of the circle to the edge of the screen on the left or the right as defined by DN. At the end of the line, or rather over it, is printed the label for the segment to which the line points. The print position for labels on the right hand side is moved to the left so that they do not run off the end of the screen, again using a logical condition.

Testing

Add the following line and RUN the program:
see colour see

You should see a display like the one at the beginning of the section for this program, except that it will be in colour rather than plain black and white.

Module 2.1.5 is the control module. ■

Most of the lines for this have already been entered, but make sure that you have all the lines listed in the module or you will miss one or two refinements.

Commentary

Lines 1000 and 1110-1130: A brief error message to indicate that there is probably an error in the layout of the DATA module — that is not infallible as a test, since some mistakes will not generate errors detectable by TRAP.

Timing

Change one of the figures under the QUANTITIES heading to a letter, then RUN the program. You should see the program error message and then the DATA module listed on. Correct the deliberate mistake and RUN the program again. This time, pressing RUN/STOP for any key once the chart is drawn should list out the DATA module.

Having looked at two different means of presenting data in high resolution mode, it is wise to remind ourselves of the immense flexibility which Commodore's excellent low resolution graphics can provide. Using the low resolution graphics characters not only provides the user with ready made effects which it would be extremely difficult to provide in high resolution, it allows the full range of colours to be employed and, on top, frees the memory which would otherwise be tied up in the high resolution screen.

In the final program we shall create a

Module 2.2.3: Lines 1000-1130

```

1000 REM*****
1010 REM CONTROL
1020 REM*****
1030 TRAP 1120
1040 GOSUB 2000
1050 TRAP 1090
1060 GOSUB 2000
1070 GOSUB 3000
1080 GETKEY AS
1090 GRAPHIC 0
1100 SCHCLR : LIST 4000-4099
1110 END
1120 PRINT "PROBABLY INVAL ID#DATAFORMAT"
1130 FOR I=1 TO 3000 : NEXT : RESUME 1100

```

three dimensional bar chart whose display, I think, one of the best demonstrations of just how impressive the CII's low resolution can be — in fact the kind of display that will have you calling in the family to show them just how clever you really are.

Module 2.2.1 looks after the initialization. It is a straightforward module to declare a small number of variables and arrays.

Commentary

Line 2000: The array H00 will be used to store the data for the graph. Since the figures in the DIM statement must be counted from zero, what is provided here is space for three sets of seven data items.

Line 2000: The string H0 will be used in the data file module and explanation can wait until that module.

Line 2070: This string is made up of three colour control codes, in characters which, if printed, change the print colour. The three colours, in order, represent yellow, green and purple. Later on, the string will be used to provide flexible changes from one colour to another.

Line 2080: This INPUT is designed to allow a later module to call up a set of data for a graph from disk (or tape).

Module 2.2.3 (which will be printed next month) accepts the data. Since we are working in low resolution, there is no need for us to adopt the fuss of using DATA statements to store changing information. Most programs which work on useful information will make provision for the user to input such information while the program is running — such programs are known as interactive. In the case of the present program, all the information can be gathered at one time, so what we see is a module which requests information, sees that information is set for more and performs checks for mistakes in entry.

Commentary

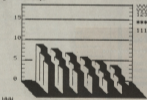
Lines 3000-3060: As with the line graph program, earlier, each single unit on the vertical axis can represent any value specified by the user. Note that because we are working in low resolution we do not have the same flexibility as the previous program in the size of the vertical axis. The only practical size for each unit is one character square's height, and the format of the graph will allow 19 units on the vertical axis.

Lines 3070-3080: The graph will allow, as mentioned previously, three sets of six bars to be presented. They will be displayed in the form of three lines of up to six solid bars. Each line of bars will be called a bank, and the individual bars will be called columns.

The final part of this article will be published next month.

This article is based upon an extract from *The Working CII* by David Lawrence. It is published by Southern Books and costs £6.95.

Figure 2.3: 3D Graph



Module 2.2.3: Lines 2000-2090

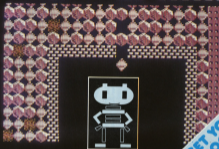
```

2000 REM*****
2010 REM INITIALISE
2020 REM*****
2030 COLOR 0,11 : COLOR 4,10 : SCHCLR
2040 CHR$(16,1,"CRYS ONICRED3ORWPH" : PRINT
2050 DIM H00(2,6)
2060 RA=CHR$(13)
2070 CO#="LEVEL3ORW" : PUR)
2080 INPUT "COL:1003LOAD#FROM#DISK#(Y/N) : " ; J
2090 RETURN

```

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COMMODORE SOFTWARE FILE

Laser Zap

Save Demos from library needs the program for the 64

THE AIM of Laser Zap is to destroy the enemy ships and capture flying letters. Let the letters move into your circles, and avoid the Zappers, which will shoot your ship if you fail to line with it. Bomb the enemy ship or it will fire bombing missiles,

and look out for the ships of your comrades plunging from the sky. More instructions are included in the program. Use a joystick in Port Dec. Collect all the letters and they spell a message, and the game comes to an end.

```

1 REM*****
2 REM LASER ZAP *
3 REMBY S. DEYHHI*
4 REMCLUS HOUSE *
5 REM*****
6 REM
7 REM MEDICINE CHARACTERS
8 GOSUB1300: DIMC(70): POKE536,120
9 PRINTCHR$(142):POKE52,40:POKE56,40:CLR:POKE56304,PEEK(56304)AND204
10 POKE1,PEEK(1)AND251:FORI=0TO111:POKE1+12288,PEEK(1+53248):NEXTI
11 POKE1,PEEK(1)OR4:POKE56304,PEEK(56304)OR1:POKE53272,(PEEK(53272)AND240)+12
12 FORN=12288TO12388:7:RND(99):POKE,N:RND(8):J=1
13 DATA 255,128,240,252,248,128,255,0
14 FORN=12792TO12792+7:RND(99):POKE,N:RND(8):NEXTN
15 DATA 0,0,3,3,255,127,63,31
16 FORC=12532TO12532+7:RND(99):POKE,C:RND(8):NEXTC
17 DATA 0,0,192,192,255,254,252,248
18 FORUV=12448+23TO12448+30:RND(99):POKE,UV,EN:NEXTUV
19 DATA 0,68,68,68,68,24,24,0
20 FORD=12794TO12794+7:RND(99):POKE,D:RND(8):NEXTD:POKE53281,0
21 DATA 0,0,68,68,68,68,128,255
22 FORI=12448TO12453:RND(1):POKE,I,1:NEXTI
23 DATA 24,24,24,68,68,68,24,0
24 REM INITIALIZE VARIABLES
25 RB=1424:RC=35636:Z=1994:ZZ=56256:I=1965:II=56257:O=1942:OO=56214:PRINT"C"
26 (P=1423:PO=55635:EM=1824:TY=55236
27 FOROD=1TO49:POKE1943+OD,195:POKE 56215+OD,6:NEXTOD
28 POKE1,62:POKE11,1
29 POKE8,0:POKE8C,1
30 PRINT"*****SCORE=00:PRINT"*****HI=SCORE"HI
31 IF P=1THEN200
32 (PU=1THEN230
33 (FKL=1THEN260
34 T=INT(10RND(1)):IF T>0THEN295
35 TT=INT(10RND(1)):IF TT>7THEN205
36 TR=INT(10RND(1)):IF TR>7THEN246
37 RT=INT(10RND(1)):IF RT>8THEN300
38 PE=PEEK(56321)
39 (FFE=254THENPOKE8,32:POKE8C,1:RB=RB+40:RC=RC+40
40 (FFE=246THENPOKE8,32:POKE8C,1:RB=RB+39:RC=RC+39
41 (FFE=247THENPOKE8,32:POKE8C,1:RB=RB+3:RC=RC+3
42 (FFE=240THENPOKE8,32:POKE8C,1:RB=RB+41:RC=RC+41
43 (FFE=253THENPOKE8,32:POKE8C,1:RB=RB+40:RC=RC+40
44 (FFE=243THENPOKE8,32:POKE8C,1:RB=RB+39:RC=RC+39
45 (FFE=251THENPOKE8,32:POKE8C,1:RB=RB+1:RC=RC+1
46 (FFE=250THENPOKE8,32:POKE8C,1:RB=RB+41:RC=RC+41
47 IF PE=239THEN185
48 POKE1,32:POKE11,0:I=I+1:II=II+1:IF I=2823THENI=1994:II=56256
49 GOTO 75
50 FORCH,32:POKE104,I:0=0:64=0:128=0+40:164=RC+40

```

```

4
107 POKE H,20:POKEHH,1
108 IF H=40:PTHEHH=40:LB=30:GOTO1000
109 IF H=41:OTHEHH=41:LB=42:GOTO1000
110 IF H=42:OTHEHH=42:LB=43:GOTO1000
111 IF H=43:THEHPKEH,32:POKEHH,1:F=0:GOTO75
112 F=1:GOTO83
113 H=H+49:MM=MM+49
114 IF H=1943:THEHPKEH,32:POKEHH,49,1:H=0:MM=0:F=0:GOTO75
115 POKEH,49,32:POKEHH,49,1:GOTO107
116 REP:MOVE SHIP
117 IF H=THEH215
118 GOTO75
119 F=1943:FF=56215:H=1
120 POKE0,63:POKE00,1:POKEP,33:POKEPP,1:LA=49+P:HY=LA-329
121 IF LA=63=40:THEH215
122 IF LA=HY:THEH225
123 LA=LA-49:GOTO221
124 U=1:GOTO85
125 POKE0,32:POKE00,1:POKEP,32:POKEPP,1
126 O=0:1:00=00-1:F=0:1:PP=1:PP=PP-1
127 IF O=1943:THEH=1942:OO=56214:H=0:U=0:TT=0:GOTO75
128 GOTO228
129 REP:MESSAGE
130 REP:K=K+1
131 IF K=33:THEHPKEH,32:POKEY,1:EM=EM+1:TY=TY+1:GOTO259
132 IFX=9999:THEHU=55296:FORV=1024TO1024+49:POKEY,32:POKEY,1:TV=TV+1:
NEXTV:GOTO 209
133 IF OP=RB=1:THEHPKEOP,32:POKEPO,1:OP=1+23:PO=55695:KL=0:J=J+1:K1=GC=GC+10:
GOTO208
134 POKEOP,K:POKEPO,1:LA=49
135 KL=1:GOTO129
136 POKEOP,32:POKEPO,1:OP=OP-1:PO=PO-1:VU=1
137 IF OP=1263:THEHOP=1423:PO=55695:KL=0:J=J+1:K1=0:GOTO75
138 GOTO 254
139 POKEH,K:POKEY,1:EM=EM+1:TY=TY+1:K1=0:GOTO75
140 DATA 12,1,19,5,10,999,26,1,16,999,2,25,999,19,999,4,5,22,1,14,9,999,3,12
141 DATA 21,2,999,8,15,21,12,5,999,13,15,4,46,9999
142 EM=1024:TY=55296:RESTORE:SC=SC+1800:GOTO2600
143 IF H=42:PTHEHH
144 JL=1-60:LI=1-329:REP:LASER ZW
145 JK=11-60:FORV=1:TDL1:STEP=49:POKEY,33:POKEY,1:IF V=RB=40:THEH1300
146 FORO=1:TO10:POKEY,32:POKEY,1:30=30+49:NEXTV
147 JK=0:GOTO75
148 KP=0:40:FO=PP=49:REP:FIRE FROM SHIP
149 POKEKP,33:POKEPK,1
150 IF KP=RB=40:THEH1100
151 KP=KP+40:FK=FK+49:GOTO329
152 REP:FELLOW RATES FALLING DOWN
153 ZH=1105:ND=55377:RD=1122:ZH=55354:LD=1142:ZL=55414:PUT=ZH+600
154 POKEZH,0:POKEHZ,1:POKERZ,0:POKE ZH,1:POKE ZL,0:POKEZL,1
155 IF ZH=49:RSTHEH1300
156 IF RZ=49:RSTHEH1300
157 IF LZ=49:RSTHEH1300
158 POKE ZH,32:POKE HZ,1:POKEHZ,32:POKEZH,1:POKE LZ,32:POKEZL,1
159 IF ZH=PUT:THEZH=0:HZ=0:RZ=0:ZH=0:LZ=0:ZL=0:GOTO75
160 ZH=ZH+49:HZ=HZ+49:RZ=RZ+49:ZH=ZH+49:LZ=LZ+49:ZL=ZL+49:GOTO345
161 POKE H,32:POKEH,1
162 POKE H=LB,182:POKEHH=LB,1
163 FOROO=1:TO9:NEXTOO
164 POKEHH=H,32:POKEHH=HH,1:POKEHH=LB,32:POKEHH=LB,1:H=0:SC=SC+160:H=0:F=0
165 P=0:O=1942:OO=56214:GOTO75
166 POKE KP=49,201:POKE FK=40,1:FORTH=1:TO100:NEXTTH
167 PRINT"XXXXXXXXXXXXXXXXXXXXOUR MISSION IS OVER"PRINT"XXXXXXXXXXXXXXXXXXXXPLAY
AGAIN Y/N"
168 GET H$F:IF H$F="Y":THEHPRINT"Z":U=0:KL=0:F=0:GOTO1225

```

```

1215 IF H&H="H" THEN#D
1220 GOTO1215
1225 IF (90-H) < 0 THEN#H1=SC
1230 SC=8 GOTO65
1240 POKE #5,281 :POKE#C,1 :FORTH=1T0280 :NEXT#H GOTO1200
1305 PRINT"#####ANDREW 2AP"
1310 PRINT"#####YOU ARE ONE OF THE SURVIVORS FROM"
1315 PRINT"#####WORLD WAR 3.YOU ARE RECALLED TO BATTLE"
1320 PRINT"#####AGAINST THE EVIL FORCES LEAD BY TRI-X"
1325 PRINT"#####YOU HAVE BEEN TOLD TO WATCH OUT FOR THE"
1330 PRINT"#####ZAPPER AND TO DESTROY THE ENERGY SHIP"
1335 PRINT"#####YOU HAVE A FLEET OF ARMY ABOVE YOU AND"
1340 PRINT"#####IF SHOT DOWN RIGHT COLLIDE INTO YOU! AND ALSO CAPTURE THE LETTERS "
1345 PRINT"#####GOOD LUCK!!!!"
1350 PRINT"#####STICK IN PORT 1 OR USE THE KEYS"
1355 PRINT "#####CTRL←BACKWARDS ←←DOWN "
1360 PRINT "#####↑UP →RIGHT←FORWARDS SPACE TO FIRE "
1365 PRINT"#####PRESS 'S' TO START"
1370 GET #B IF #B="S" THENPRINT"#####WRITE←RETURN"
1375 GOTO1370
2000 PRINT"#####YOU HAVE SURVIVED YOUR MISSION ALL DONE!"
2005 PRINT"#####BUT NOW YOU MUST Carry ON YOUR BATTLE"
2010 FOR#X=1T0280 :NEXT#X :GOTO70

```

Doubler

Andrew Tilly from *Knowledge* sends this Vic 20 program.

ANDREW'S program gives double sized characters on every letter and symbol on the Vic 20 keyboard.

Once RUN, the program takes 30 seconds to set up the magnified characters, since there are 3000 numbers to be

printed in. You can then MOVE the program and use the new character set.

POKE: MOVE, 30 can be used to minimize the screen, otherwise you may not be able to see the cursor position. Simple but extremely effective.

```

10 A=5120 :Z=5120
15 B=PEEK(A+27640)
20 POKEZ,B
30 Z=Z+1
40 POKEZ,B
50 A=A+1 :Z=Z+1 :IFZ>7678THEN#0
60 GOTO10
70 POKE36869,253 :POKE36867,PEEK(36867)OR1:

```

Space Mines

Kevin Hughes sends this program for the unexpanded Vic 20.

SPACE MINES is a version of Lunar Lander. You must guide your spaceship through the mines to a safe landing, using the joystick. After three safe landings you get a bonus take-off, where you score points by ramming the mines and docking

with your mother ship.

You can use the Cmdr keys to control the ship if you prefer. Press A on the fire button to shoot, and beware of mine dangers such as the black mine. Tread very carefully.

```

10 PRINT"#####POKE36879,221
15 PRINTPRINT
20 PRINT"
25 PRINT"
30 PRINT"
35 PRINT"
40 PRINT"#####
45 PRINT"#####
50 PRINT"#####
BY KEVIN HUGHES"

```

```

400 PRINT"### HIT A KEY WHEN READY"
70 FOR I=12510385STEP-1-H*4+1 POKE36625,I:POKE36670,15:POKE36675,120+H:FOR J=17040:
NEXT J,1
75 POKE36675,0
80 GET#A:IF#A=""THEN800
100 POKE36675,0
110 FOR T=0T01000:REPEAT:IF#A=-1THEN150
115 POKE7424+T,0:NEXT T
150 DATA 16,24,20,18,255,99,49,16,0,0,44,127,255,255,255,255
160 DATA 0,0,0,0,0,32,0,0,24,36,126,255,129,189,0,0,153,129,90,126,24,24,255,24,60
170 DATA 217,126,96,126,195,201,195,255,0,0,240,36,48,24,55,127
180 DATA 0,0,0,0,0,60,254,254,0,24,48,72,255,18,12,0
190 DATA 0,24,24,60,255,126,255,255,-1,0,0,0,0,0,0,0
195 FOR T=0T07:REPEAT:POKE7424+T,0:NEXT
200 PRINT"|" POKE36675,0:POKE36669,255
210 PRINT"### GRAPHIC SYMBOLS"
215 PRINT
220 PRINT"R R LASER"
221 PRINT
225 PRINT"R R PLANET SURFACE"
226 PRINT
230 PRINT"B B BOSTARS (HAPPINESS)"
231 PRINT
235 PRINT"B C BLANDING CRAFT"
236 PRINT
240 PRINT"b, D BMINES (DENSELY)"
241 PRINT
250 PRINT"R E BLANDING PRB"
251 PRINT
260 PRINT"R F B BROTHER SHIP"
261 PRINT
270 PRINT"R I LASER TOWER"
271 PRINT
277 PRINT"### HIT A KEY WHEN READY"
278 GET#A:IF#A=""THEN278
310 PRINT"|" POKE36675,26:POKE36669,240
320 PRINT"#####INSTRUCTIONS (W/N)"
330 GET#A:IF#A=""THEN330
340 IF#A="Y"THENPRINT"|" GO10370
350 IF#A="N"THENPRINT"|" GO107000
360 GO10330
370 PRINT"YOU ARE GUIDING YOUR SHIP DOWN TO THE SURFACE OF THE RED PLAN
ET,
375 PRINT
380 PRINT"YOU HAVE TO MISS THE MINES AND LAND YOUR CRAFT SAFELY ON LAND
190 PRB
395 PRINT
399 PRINT"FOR EACH SUCCESSFUL LANDING YOU GET 10 POINTS.
399 PRINT
400 PRINT"AFTER THREE CONSECUTIVE LANDINGS YOU GET A BONUS TRIE OFF.
405 PRINT
410 PRINT"R HIT A KEY WHEN READY"
420 GET#A:IF#A=""THEN420
430 PRINT"|"
440 PRINT
445 PRINT"HERE YOU SCORE BY RAMPING THE HOME (10 POINTS PER HOME)"
450 PRINT
455 PRINT"YOU MUST RETURN TO YOUR WAITING BROTHER SHIP TO AVOID LOSING A LI
FE"
460 PRINT
465 PRINT"ALSO IF YOU DRIFT INTO THE LASER RAYS THEN YOU WILL FORN PERI
SH"
470 PRINT
475 PRINT"DENISE THE BLACK HOLE!"
480 PRINT"### HIT A KEY WHEN READY"
490 GET#A:IF#A=""THEN490
500 PRINT"|"
505 PRINT"### CONTROLS"
510 PRINT"### C D LEFT & RIGHT"
520 PRINT

```

```

525 PRINT# 4 FOR ABORT#
530 PRINT#50000 OR JOYSTICK#
535 PRINT#5000 FINE BUTTON TO ABORT#
540 PRINT#500 HIT A KEY WHEN READY#
550 GET# :IF#="" THEN#530
7000 PRINT#7
7010 STOP

```

Jellypuss

P. M. Armstrong sends this Mr. PC game from Canberra

THE OBJECT of Jellypuss is to get your diver safely to the marine castle.

Blocking your way are a variety of nasty submarine creatures, and to avoid them you must use the keys A and B to move left and right.

You'll hear a sound effect every time you

reach the castle.

Program notes

It sets sound effects

1; GOSUB to leave graphics

2; GOSUB to instructions

3; clear screen, sets score to 0

4; GOSUB to routine setting number of lives you require

150-650; sets up main title

650; music for start of game

660; prints score and lives

670-790; prints five Jellypusses in random

positions

700-730; plots castle in random position

740-760; plots diver

770; tests to determine whether diver has

reached bottom of screen

775; tests to see if lives = 0

780-790; moves diver

800-830; tests to see if diver has collided with Jellypuss

830-850; tests to see if diver has reached the castle

2000-2020; another go!

You can alter the number of lives allowed by modifying 3000-3020.

```

0 V1=36879:G1=36876
1 GOSUB3000
2 GOSUB6000
3 PRINT"OK":POKE36879,45:SC=0
4 GOSUB3000
340 PRINT
350 POKE36879,15:POKE36876,199:PORT=(170400-HEXT:POKE36876,0
600 PRINT"J":POKE36880,255:PRINT"*****JELLYPUSS*"
610 PRINT"*****BY HEM"
620 PRINT"*****GHT:SHV:MEV*"
630 GET# :IF#="" THEN#630
631 PRINT"J":FOR#=(170400STEP-1:POKE36878,#)
632 FOR#=(170400-HEXT
634 FOR#=(22070240:POKE36876,#) :HEXT:HEXT
640 PRINT"SCORE=":SC:PRINT"*****LIVES=":L1:POKE31,0
670 FORL=1TO5
675 E=INT(RND(1)*6190)+7830
680 POKEE,1:POKEE+1,2:POKEE+21,3:POKEE+22,4:POKEE+23,5
690 POKEE+43,6:POKEE+44,7:POKEE+45,8
700 NEXTL
710 D=(HT(RND(1)*6123)+7895
720 POKEH,1:POKEH+1,12:POKEH+22,13:POKEH+23,14
740 H=7713
750 POKEH,9:POKEH+22,10
760 H=H+22
770 IF#<164 THEN#L1=L1-1:GOTO640
772 IFL1=0 THEN#PRINT"YOUR SCORE=":SC:GOTO2000
775 FOR#=(17039) :HEXT:POKEH-22,32
780 IFPEEK(157)=16 THEN#H=H+1:POKEV1,15:POKEV1,199:POKEH-1,32:POKEV1,0
790 IFPEEK(197)=16 THEN#H=H-1:POKEV1,15:POKEV1,199:POKEH+1,32:POKEV1,0
800 IFPEEK(H+22)=1 THEN#L1=L1-1:GOTO640
810 IFPEEK(H+22)=2 THEN#L1=L1-1:GOTO640
820 IFPEEK(H+22)=3 THEN#L1=L1-1:GOTO640

```

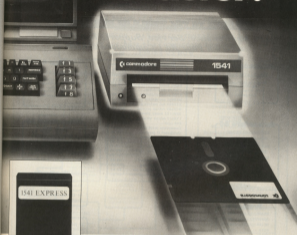
```

830 IFPEEK(CH+22)=4 THEN L1=L1-1:GOTO640
840 IFPEEK(CH+22)=5 THEN L1=L1-1:GOTO640
850 IFPEEK(CH+22)=6 THEN L1=L1-1:GOTO640
860 IFPEEK(CH+22)=7 THEN L1=L1-1:GOTO640
870 IFPEEK(CH+22)=8 THEN L1=L1-1:GOTO640
880 IFPEEK(CH+22)=9 THEN L1=L1-1:GOTO640
890 IFPEEK(CH+22)=10 THEN SC=SC+10:POKE$1,230:GOTO640
900 IFPEEK(CH+22)=11 THEN SC=SC+10:POKE$1,230:GOTO640
910 IFPEEK(CH+22)=12 THEN SC=SC+10:POKE$1,230:GOTO640
920 IFPEEK(CH+22)=13 THEN SC=SC+10:POKE$1,230:GOTO640
1000 GOTO750
2000 PRINT"ANOTHER GO?"
2010 POKE190,0:INPUT@I:IFG@="Y" THEN GOTO5
2020 IF@="Y" THEN POKE3680,240:PRINT"IT-END"
2030 PRINT"*****PLEASE WAIT*" FOR#=1 TO 51:POKE7160+#,PEEK(32760+#):NEXT
4040 DATA 0,240,16,30,224,64,60
4050 FOR#=7168 TO 7175:READ:POKE#,C:NEXT#
4070 DATA 0,0,0,0,0,32,32,19,0,0,0,0,0,120,0
4080 FOR#=7176 TO 7199:READ:POKE#,E:NEXT#
4090 DATA 0,0,0,0,1,0,0,1,20,190,99,36,225,41,41,145
4100 FOR#=7191 TO 7205:READ:POKE#,G:NEXT#
4110 DATA 0,192,100,0,0,0,0,1,1,0,0,0,0,0,0
4120 FOR#=7206 TO 7220:READ:POKE#,I:NEXT#
4130 DATA 0,0,0,0,0,0,0,0,192,0,0,0,0,0,0,0
4140 FOR#=7221 TO 7235:READ:POKE#,K:NEXT#
4150 DATA 24,36,100,100,124,60,60,36,36,100,0,0,0,0
4170 FOR#=7236 TO 7250:READ:POKE#,M:NEXT#
4180 DATA 60,240,240,240,216,216,216,321,31,31,31,27,27,27,91
4200 FOR#=7251 TO 7265:READ:POKE#,O:NEXT#
4220 DATA 25,25,287,286,286,286,204,204,250,250,243,115,115,115,127,127
4230 FOR#=7266 TO 7280:READ:POKE#,P:NEXT#
4250 RETURN
5000 PRINT"12404 1000 LEVELS(1-4)"
5010 INPUT#M
5020 IF#="1" THEN L1=1:RETURN
5030 IF#="2" THEN L1=2:RETURN
5040 IF#="3" THEN L1=3:RETURN
5050 IF#="4" THEN L1=4:RETURN
5060 RETURN
6000 PRINT"*****INSTRUCTIONS*"
6010 PRINT"*****YOU ARE A DIVER*"
6020 PRINT"*****AND ARE TO GET*"
6030 PRINT"*****TO THE MARINE CASTLE*"
6040 PRINT"*****SAFELY, AVOIDING*"
6050 PRINT"*****THE JELLYFISH*"
6060 PRINT"*****AND THE CONTROL*"
6070 PRINT"***** - LEFT*"
6080 PRINT"***** - RIGHT*"
6090 PRINT"*****HOLD IT A KEY*"
7000 GET:IF:IF:="" THEN GOTO7000
7010 RETURN

```

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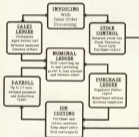
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Mind Stretchers?

Book: *Commodore 64 Mind Stretchers*

Author: Ian Cheney

Publisher: Signet

Cost: \$5.97

Reviewer: Daphne Zerkine

This book contains a mixture of games and utilities — some 40 programs in all. There is a sprite editor, a character editor and old favorites like *MysticMind*, *Snake*, *Lily* and *Poker*.

There is nothing particularly wrong with this book, except that it is two years late. The days when you could put out books of "40 best programs for your . . ." are long gone. Micro users are now much more discriminating.

Given the flood of computer books over the past year, there is surely little scope for titles which do no more than bundle collections of programs together. More imagination please.



Beginners guide to the Vic 20

Book: *The Assembly Easy Way To Program Your Vic 20*

Author: Peter Dunlop

Publisher: Inverloch

Price: £3.95

Reviewer: David Skelton

If you've struggled with the manual, then this is the book you've been waiting for! That's how the book starts off, and it

indicates what level it is aiming for, but if you have mastered the manual, don't let that put you off considering this book. It is one of the best I have seen from Interface. Like many of their books, it is well printed and prepared, it is very easy to read and easy to follow, even for an absolute beginner. Unfortunately it does have about two printers errors in each of the 11 chapters, but that shouldn't spoil your enjoyment.

Also, the author has a refreshing sense of humour which shows that he has enjoyed writing the book. The book has been set out with plenty of example programs, with lots of bold print for emphasis, and throughout the book large clear print is used, so if you've been staring into a screen for hours, this book shouldn't give you any problems.

Stephano takes you from simple things like how to set up your new computer, use of the cassette and keyboard, through to how to make the most of *POKEs*, *POKEs* and *Strings*, and also touches on the available peripherals.

The author himself states this is a book for the absolute beginner — well, it is, but it could also be a valuable addition to anyone who has perhaps moved up to a Vic. The programs included range from simple economic programs to Hi-res and educational games. Considering the price of many books these days, you could do a lot worse than buying this one.

After the arcade

Book: *Working With Easy Script*

Author: Randall McMillan

Publisher: Granada

Cost: £3.97

Reviewer: Mark Ains

When arcade games begin to lose their thrill, when the thought of tapping out another alien begins to pall, most micro users turn towards more serious applications. Perhaps the most common serious use of micros is word processing. For 64 owners, this generally means *Easy Script*, which is Commodore's own brand word processor for the 64.

In *Working With Easy Script*, Randall McMillan adopts a straightforward approach, encouraging the reader to start word processing immediately and learn by doing. All the basic commands are here, from inserting and deleting text to mail merge and page size. There is even a sample letter from Mark Carraway to JR Irving — Randall McMillan must be a Dallas fan!

This book will be more useful for beginners than for experienced users, but there is something for almost everyone. The only real criticism is that the section on printers and print editors is rather slimsy, but there it is a topic which deserves a book in its own right.

Advanced handbook

Book: *The Advanced Commodore 64 Handbook*

Author: Peter Lupton and Franz Robinson

Publisher: Century

Cost: £6.95

Reviewer: Phil Auster

If as a supplier you are an enthusiastic user of a 64, this is probably the book you would like to go further. You have examined Commodore's

Programmer's Reference Guide but find parts of it too technical. You would particularly like to experiment with sound and Hi-res graphics, in Basic and Assembler, to understand the Basic Interpreter and to add a few extra commands to Basic. The trouble is that you have been unable to find a suitable book to assist you.

Look no further! This superb volume is the very thing you need. Intended as a companion to the *Commodore 64 Handbook* by the same authors, it stands on its own as a well written, informative and useful volume for any 64-owner's bookshelf. As well as covering the points mentioned earlier, it provides a comprehensive guide to the use of disks and printers in a manner far superior to Commodore's own offerings. Add to this numerous listings of program examples and utilities, and you have a publication which is hard to resist.

This is indeed a book to dip into at random and explore in depth. It is packed with information presented clearly and logically, with several helpful appendices. It would almost be worth £6.95 for the Hi-res routines alone. My only criticism is of the index, which is practically non-existent, but compared with the rest of the book this is a minor irritant. Highly recommended!

Learning with Adventures

Book: *Learning With Adventures Program*

Author: Rosetta McLeod

Publisher: Melbourne House

Cost: £5.95

Reviewer: Jeremy Dixon

Computers in education is a much abused phrase. While computers are often used in schools, it is usually for administration or computer studies. There are depressingly few instances where computers are used in English, geography or history.

However, Rosetta McLeod has set out to show how computers can be used to teach a variety of skills including light, use of English and map drawing.

Concentrating on four commercially available adventures — *The Hobbit*, *Patrials*, *The Quack* and

Snowed! — Rosetta McLeod explains how parents and teachers can set exercises and tests which draw on popular computer programs. For example *Write a review of The Hobbit* for inclusion in a computer magazine!

The book is illustrated with photos and examples taken from Rosetta McLeod's pupils in Aberdeen. An extremely interesting and worthwhile book, at a low price of £5.95.



Two out of ten for Rosetta McLeod

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ANSWER BACK

Standard abbrs.

WHEN TYPING in a program recently I discovered that standard abbreviations used in BASIC statements produce strange but consistent results when listed. P (DATA) gives not POKE but PDATA for instance. How and why does it happen? And can Turbo loading programs such as a Feedback damage the computer in any way?

P. Chen
Sudham

ALL UNSHIFTED characters after a BEEP will not currently, but may be produced by shifting above keyboard characters which produce graphics when shifted are interpreted as tokens, and converted into keywords. You can avoid this by placing them within quotes.

Thus when you enter P (SHIFT) O, the P is exchanged and the shifted O is converted into the keyword DATA. On other CBM machines the conversions may be different. However, if you use a line like the 64 or any other BASIC I mentioned such as 10 BEEP "shift" I, then all data after the shifted I will vanish, and the error message "Syntax Error" will appear when listed.

I haven't heard of any damage being caused by turbo loaders, although I haven't tried the Feedback program you mention.

Restore line

I HAVE a book called *More Basic Computer Games*, and cannot make the longest game work because it uses RESTORE (line number) commands. I've tried a number of different ways of presenting these commands, but my 64 won't accept them. Can you help?

P. Gil
New Timperley
Cheshire

SOME Basics have the command "RESTORE" (line number) — CBM Basic does not. The data pointer is set to that line, not to the earliest DATA statement as in the case in Commodore Basics. You will have to amend the READ routine, and also use a marker as the first item of DATA on the line you wish to RESTORE.

```
10 READ#A$:<>
   "marker" THEN FOR
   I=1 TO 1000:READ#A$
   NEXT I:GOTO 1000
20 READ A$
30 rest of program
40 data tag,5,2,3,4,5,7,8,
   9,10
50 data marker,11,12,13,14,
   15,16,17,18,19,20
```

64 to 3000

WILL YOU let me know if there is any hardware available which will let me use a Commodore Series 3000 disk drive and printer with my 64?

Ge. Aronson
Forsyth
Sussex

THERE ARE several suitable interfaces available, for instance the CBM64 IEEE 486 cartridge, price £29 plus VAT from PCL, 47 London Road, Southborough, Tunbridge Wells, Kent, phone 0893-2164. This allows the 64 to access and control all CBM IEEE programs. The cartridge plugs into the rear of the 64 and accepts a standard IEEE 486 lead to connect to the first peripheral. Subsequent devices are daisy chained with standard IEEE 486 leads.

However, if the software you are running uses the spare from 16:00 to 16:FFF then you cannot use this cartridge. In that case you might want to investigate the BAMB interface or the Interlog, now handled by Chertok marketing and featured in October's *Commodore Magazine*.

PRG for paddles

CAN YOU give a short routine explaining the use of

paddles? I have a pair lying around the house doing nothing because I don't understand how to use them? Please! Alex

Richard
Glasgow

THE ROUTINE for using paddles is rather long and incorporates some machine code. You'll find it listed and explained on pages 144-147 of the *Commodore 64 Programmers Reference Guide*.

Finding the address

IN THE August issue of *Commodore Horizons* there was a program called ADDRESS by Chris Payne. In order to get the program to work effectively, large amounts of data need to be stored on tape. Could you make some suggestions on how to arrange and store the required amounts of data, or suggest some books which explain data handling in Vidi? W. Pharoah
West Bromwich
Midlands
Business Applications for the Commodore 64, by James Hall, published by Sunstone, should be of great help to you. It contains programs and subroutines which deal with data handling both on disk and tape.

Flashes and crackles

I HAVE recently purchased a Vii 20 for my son, and have been picking up inexperience on the screen, showing up as short flashes and crackles. The TV and the computer itself appear to be OK, but as we are about half a mile away from a Plessey factory it seems that the Vii is picking up some sort of signal. Can you suggest any way to shield or isolate it?

TRY A surge protector plug, which eliminates voltage surges on the mains. This could be caused by your being on the same circuit as Power's, or a local hospital, or even other electrical appliances in your own house. You can obtain such a plug for £11.00 from

Northrop EMP Ltd of Stevenson Road, Brighton, Sussex, BN2 2HF.

Expander in print

I HAVE RECENTLY purchased a Vii 20 with Super Expander, and I find it very hard to find any programs utilising the expander. Could you suggest any books? Ken Sorell
Tipton
Sussex

YOU CAN find many programs using the Super Expander in a book called *Vii Graphics* by Nick Humphreys, costing £6.95 from Deskworks, The OM Plans Factory, 43 Glenborough Crescent, London. All the programs in the book are also available on cassette from the publishers.

Cobol query

I AM A relative newcomer to the world of computers, but I anticipate going to college later this year to take a diploma course.

I've been told that it would be a help if I could gain some experience in Cobol, but I can't find a supplier of a version in this language. Can you help?

Michael Fox
Aylesbury
London

COBOL on the 64 could only be used in conjunction with the new Commodore CP-M cartridge. CP-M is an operating system which allows access to a wide range of business programs, and you should be able to find a suitable version of Cobol over this cartridge if listed. Unfortunately, at the time of writing, no firm release date has been set for the Commodore CP/M cartridge.

If you need help with a technical query or problem write to:
Jack Cohen,
Commodore Horizons,
12-13 Little Newport
Street, London
WC2R 2JD

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SOFTWARE

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IBM 64 Software to exchange/sell. Titles include R.A.C., Genetics, Base, Assembly, Beach Head, and much more. Gary Tan, 18 Winger Close, Bury, Lancashire BL9 1XD or Phone: 081 781-4806 after 7.15 p.m. ask for Gary.

FOR SALE the Habitat and Solo Flight for IBM 64. Both new and unused £10 each. Tel: 0273 72 47344 after 9 p.m.

IBM 64 PROGRAMS to swap or sell. Many titles including American, Write in Stephen Keenan, 22 Westmoreland Lane, Foxcote, Duxton 18, Inford, Dor: 01845 5434.

IBM 64 Software to swap. Hunt many titles, including some American. Example Zaxxon, Des on One. Send list to Gary, 22 Downmore Way, Balfour, Lymington 129 2D Hampshire, all letters replied.

COMMODORE 64 software for sale. Washington £4.50, Iron City £3.50, Joe Corbinato 04, Newark 018 60. Toppass sold for £13.50, Contact S. Gary, 7, Holy Haven, Bishopswood, Glasgow G84. Send SAE with postal order if not, money returned.

VIC 20 games for sale. Computer War, 7 of 100, Sub Commodore at £3 each. Bouzer 18, Stranish, Jersey, Jersey, The Wizard and Princess 4.00, Goldbrides Arab, Race, Football, Drummer and Racehorse cartridge £1. Ring Dougan on 01643 66000 any time after 6.30 p.m.

COMMODORE 64 software for sale, most half price. Zaxxon £15, Jumpin £15, Ace £4, Easy Script £30 (with original manuals). Also wanted Legends from Gary, Mervyn Clark, 15 Windish Road, Birmingham B20 7WJ, might swap. Tel: Westcoasts 268888 after 9 p.m.

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IBM 64 Software half price. Personal 64 disc £20, Data Manager cassette £10. Data Manager disc £10, Utility 04 cassette £8. Tel: Winton in Thames 08933 241242.

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C64-65

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1984

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The cost for each book issue is £1 including postage and handling. Please make cheques payable to Commodore Horizons. Subscriptions for next year are available of course, see the code in this issue.

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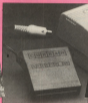
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No proper names, plurals, or abbreviations are allowed. When you've completed your list, fill in the competition

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The ten winners who give the largest correct lists of words will win the speech synthesizers.

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1. Where software is available from our publisher.
2. Where software is not available from our publisher, we will do our best to make sure you are satisfied that your purchase fully meets your requirements to its value and satisfaction, having replacement.

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THE BIG THREE

THREE ESSENTIAL PACKAGES CAN BE YOURS FOR WELL UNDER THREE FIGURES!



DATABASE

Micro Magpie for the Commodore 64 is probably the most advanced database management system available for any home micro. With Micro Magpie you can create a database system tailored exactly to your own information handling requirements.

With most database systems, you only get out what you put in. Micro Magpie gives you more: it can manipulate data between different files, perform calculations on numerical data, print out reports, and filenotify data in graphical form. Only Micro Magpie can give you all these features.

- Fully user programmable database management system.
- Operated by easy-to-use pop-up menus using just four keys.
- 8084 machine code program for speed and compactness.
- Easy pointers complex calculations on numerical data.
- Searches on any field, with wild card and just-field matching.
- Works with one or two 5.25 disk drives.
- Hierarchical or vertical bar graph or scatter graph output.
- Integral Commodore interface for greater printer options.
- Professionally written instruction manual.
- Help readily available from Help Desk.
- Free application templates—Mastering Natural Touch Control.

Micro Magpie would be essential software if you bought it for the applications alone. But you can find a highly sophisticated Mastering tool system up and running within minutes, and you'll still be using only a fraction of Micro Magpie's potential. Once you start taking your own custom applications, you will begin to discover why Commodore user magazine called Micro Magpie "the software Sledgehammer of the year".

MICRO MAGPIE **ON DISK ONLY**
£39.95 inc VAT



SPREADSHEET

Micro Swift—the affordable professional spreadsheet system for the Commodore 64. Micro Swift will grow with your business or around the house to construct models of income and expenditure, for carrying out recent "what-if" calculations to see how a change in one or more figures affects all the other figures, or for specialized applications where complex number crunching is required.

Micro Swift is unique in that it is operated by pop-up menus, a system pioneered by our Magpie database program. No longer do you have to memorize a whole hierarchy of commands and control keys—the menus appear when you want them, and disappear when you don't.

Micro Swift is written totally in machine code (like our other spreadsheets) to maximize speed and compactness, giving you more room to construct more complex models.

Micro Swift gives you the following advantages:

- All in 256K cell memory.
- Variable cell widths.
- Split screen facility.
- User definable numerical precision and display formatting.
- Integral Commodore interface for greater printer options.
- Automatic production of user-programmed spreadsheets.
- Operated by menu to our pop-up menus.
- Easy study-programmed applications included.
- Full storage on disk or cassette.
- Full instruction manual included.

Don't be fooled by the price! Micro Swift gives you facilities equal, if not superior, to spreadsheets costing many times more. Micro Swift is available on disk or cassette. Micro Swift—Spreadsheet power to the people!

MICRO SWIFT - **ON DISK OR CASSETTE**
£19.95 inc VAT



WORD PROCESSOR

Micro Wordcraft is our new advanced professional word processor. It is a direct descendant of the highly elegant and powerful program, which is in full world-wide use on the larger Commodore machines, Sanyo and IBM PC, on Windows in 8086-machine code. Micro Wordcraft gives affordable office quality word processing for the home or business user.

It is often said that "you get what you pay for", but with the Audiogenic Professional Series you get what you pay for and more!

Micro Wordcraft gives you all these advanced facilities:

- Full text control—document width up to 90 columns, tabs, double tabs, justification and centering.
- Full text manipulation—on-screen editing, block moves, block delete, string search and replace, underlining and underlining.
- Formatting screen display, uncluttered by control characters.
- Name and address files can be created and merged into standard letters.
- Easy composing of standard paragraphs. Compatible with Commodore parallel and IBM printers.
- Integral Commodore interface for greater printer options.
- Instantly accessible help screens.
- Comprehensive instruction manual included.

The name and address merging capabilities of Micro Wordcraft make an ideal tool for shop businesses, clubs, societies or hobby groups, where there are regular mailings of standard letters. For home use, Micro Wordcraft ensures all the features you could ever need, at a price you can easily afford.

MICRO WORDCRAFT - **ON DISK ONLY**
£24.95 inc VAT

The Audiogenic Professional Series represents a price breakthrough for business-orientated software products. With Micro Magpie, Micro Swift, and Micro Wordcraft, the power and convenience of the computerized office can be a reality for all Commodore 64 owners.

Each of the three products represents the state of the art in its particular field. Great care has been taken over the documentation to make sure that you, the user, can quickly make use of the facilities available. Also, a full back-up service is provided by the Audiogenic Technical Department, who are only a phone call away if you have any queries about the products.

So, whether it's for your home, business, club or society, make sure you go for the Audiogenic Professional Series!

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